THE REVIEW

OF

APPLIED MYCOLOGY

Vol. XVIII

ISSUED BY THE IMPERIAL MYCOLOGICAL INSTITUTE

THE IMPERIAL MYCOLOGICAL INSTITUTE
KEW, SURREY

1939

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PRINTED IN GREAT BRITAIN AT THE UNIVERSITY PRESS, OXFORD
BY JOHN JOHNSON, PRINTER TO THE UNIVERSITY

ERRATA

VOLUME XVI

page 561 line 45 for '*Typha elephantina*' read '*Pennisetum purpureum*'
572 33 for '*Leucaena pulverulenta*' read '*Albizzia jubibrissin*'

VOLUME XVIII

2 46 for 'Lumber' read 'Limber'
40 32 for 'Noak' read 'Noack'
73 22 for '*P. strobi* (*C. ribicola*),' read 'and *P. strobi* (*C. ribicola*).'
89 39 for '(*Amomum subulatum*)' read '[*Elettaria cardamomum*]'
137 1 for 's'Jacob (S. C.)' read 's'Jacob (J. C.)'
170 47 for '*U. panici-miliacei*' read '*Sphacelotheca sorghi*'
48 for '*Panicum miliaceum*' read '*Sorghum* sp.'
178 8 for '*potroni*' read '*potronii*'
233 32 for '*Amomum subulatum*' read '*Elettaria cardamomum*'
35 for '*Elletaria cardamomum*' read '*Amomum subulatum*'
270 33 for '*Acerotagallia*' read '*Aceratagallia*'
274 15 for '*Typha elephantina*' read '*Pennisetum purpureum*'
284 21 for 'Garren (K. M.).' read 'Garren (K. H.).'
315 10 for '*fasciculatis*' read '*fasciculatus*'
14 insert 'n.sp.' after '*humuli*'
40 for '*oyxsporum*' read '*oxysporum*'
321 23 for '(?) *copallina*' read '*glabra*'
379 47 for 'xvii' read 'xviii'
389 21 insert 'subsequent' before 'appearance'
23 for 'and the first pustules' read 'but pustules subsequently'
446 10 for '*Bacterium*' read '*Bacterium tumefaciens*'
452 9 for 'xiv' read 'xvi'
468 46 for 'xii' read 'xxii'
487 13 for 'Davidson (W.)' read 'Davidson (R. W.)'
504 43 for '*juranum*' read '*juruanum*'
506 5 for 'Eastern' read 'Easter'
517 23 for '*ehrenbergi*' read '*ehrenbergii*'
36 for '444' read '472'
523 22 for '*ectoendothrix*' read 'ecto-endothrix type'
34 for '*endoectothrix*' read 'ecto-endothrix type'
533 8 for '*J.*' read '*G.*'
551 42 delete '*claytoniana*'
573 4 for 'are' read ', one'
625 32 for '*Himatia*' read '*Himantia*'
655 35 for '*hypolaterita*' read '*hypolateritia*'
689 4 for 'perithecia' read 'conidia'
726 19 for '43' read '431'
792 6 for 'increased' read 'decreased'
822 14 for '*Elettaria cardamomum*' read '*Amomum subulatum*'

IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW
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VOL. XVIII JANUARY 1939

PASSAVALLI (L. P.). **I Castagneti da frutto in Toscana e nell' Emilia. (Cause del loro deperimento e possibilità di migliorarli.)** [The edible Chestnut groves in Tuscany and Emilia. (Causes of their dying-off and the possibility of improvement.)]—*Alpe*, xxv, 4, pp. 106–117, 5 figs., 1938.

The writer summarizes and discusses the rapidly deteriorating economic position of the edible chestnut industry in Tuscany and Emilia, and suggests a number of technical and cultural measures for its improvement, including the extended cultivation of the Shiba and Tamba Japanese varieties, resistant to ink disease [*Phytophthora cambivora*: *R.A.M.*, xvii, p. 637], which is stated to be present in groves covering an area of 1,024 hect. in the province of Bologna alone.

BUCHWALD (N. F.). **Om Angreb af Kulsvamp (Ustulina vulgaris) paa Lind (Tilia vulgaris).** [On the infection of Lime (*Tilia vulgaris*) by the coal fungus (*Ustulina vulgaris*).]—*Dansk Skovforen. Tidsskr.*, *1938*, pp. 239–243, 1938.

Evidence is briefly adduced for the occurrence of *Ustulina vulgaris* in a parasitic form on old lime (*Tilia vulgaris*) trees [*R.A.M.*, xv, p. 471] in a park avenue at Holsteinborg, Denmark. The mycelium of the fungus was isolated in pure culture from several of the specimens. *U. vulgaris* produces a typical white rot and is believed to enter the trees through wounds inflicted during the operation of lopping adventitious basal shoots; this means of ingress should be barred by the application to the cut surfaces of carbolineum or some similar fungicidal substance.

PONOMAREFF (N. V.). **The conidial stage of Hypoxylon pruinatum.**—*Phytopathology*, xxviii, 7, pp. 515–518, 2 figs., 1938.

The conidial stage of *Hypoxylon pruinatum*, the agent of a destructive canker of aspens (*Populus tremuloides*) [*R.A.M.*, ix, p. 421] in Minnesota and other Lake States, is stated to have been hitherto known only in culture and is here described on the basis of an examination of material either naturally diseased or infected as a result of inoculation with ascospore cultures. A few weeks after invasion the fungus forms a subiculum on the surface of the cortex and within three months conidial fructifications begin to appear on this subiculum, still covered by periderm. At first they comprise compact, coremium-like tufts of

dichotomously branched conidiophores, 75 to 150 μ in length, but they gradually become stromatic in texture, and measure 1·5 by 0·85 mm. The apices responsible for breaking the periderm are sterile, but on all other parts of the stromata and subiculum fertile conidiophores develop. The stromata soon fall off, leaving only minute, jagged remnants and circular scars. By the time the perithecial stromata are produced, practically all trace of the conidial fructifications has disappeared, so that previous failures to recognize the imperfect stage are not surprising. The conidia formed at the geniculate ends of the terminal conidiophore branches are hyaline, unicellular, fusiform to elliptical, 5·5 to 6·7 by 2 to 3 μ, and germinate readily on malt agar.

WILKINS (W. H.), HARLEY (J. L.), & KENT (G. C.). **The ecology of the larger fungi. II. The distribution of the larger fungi in part of Charlton Forest, Sussex.**—*Ann. appl. Biol.*, xxv, 3, pp. 472–489, 1 diag., 1938.

In this second contribution to their study of the ecological relationships of the larger fungi [*R.A.M.*, xvii, p. 278], the authors record the results of their examination of the fungi found in a plateau beech wood on the South Downs in Sussex towards the end of the summer of 1932, in relation to the type of the surrounding vegetation, and nature and reaction of the soil. Useful information on the factors affecting the distribution of certain species can be deduced from the results obtained, the co-ordination of which, however, is not attempted as the data are inadequate.

HIRT (R. R.) & ELIASON (E. J.). **The development of decay in living trees inoculated with Fomes pinicola.**—*J. For.*, xxxvi, 7, pp. 705–709, 1 fig., 1938.

Fomes pinicola [*R.A.M.*, xvii, p. 786] was reisolated in a viable condition after ten years from experimentally inoculated poplar (*Populus grandidentata*), *Tsuga canadensis*, *Picea rubra*, and birch (*Betula lutea*) in the Adirondacks, New York State. The fungus had formed no fruiting bodies and there was no external evidence of its presence in the heartwood, where the decay was relatively slow, extending vertically for a maximum distance of 95 in. (in *P. rubra*). Generally speaking, the mycelium of *F. pinicola* from coniferous hosts was equally well able to cause rotting of hardwoods and vice versa. *Pinus strobus* reacted negatively to inoculation with the fungus, while in *Abies balsamea* and beech (*Fagus grandifolia*) no clear distinction could be made between the rots due to *Fomes pinicola* and those associated with natural infection by *Polyporus balsameus* and *F. applanatus* [*Ganoderma applanatum*], respectively. The very slight amount of decay in *A. balsamea* and its absence in white pine suggests that the normally heavy resin impregnation of these woods exerts a protective influence, which may be counteracted by deep injuries or dead branches giving ingress to the fungus.

CUMMINS (G. B.). **A new microcyclic Coleosporium on Lumber and Piñon Pines.**—*Phytopathology*, xxviii, 7, pp. 522–523, 1 fig., 1938.

A Latin diagnosis is given of *Coleosporium crowellii* n.sp., a micro-

cyclic rust collected by I. H. Crowell on *Pinus flexilis* and *P. edulis* needles in New Mexico in 1937. The amphigenous, subepidermal, linguiform teleutosori measure 0·3 to 0·7 mm. in height, 0·5 to 2 mm. in breadth, and 0·1 to 0·15 mm. in thickness on *P. edulis*, the corresponding dimensions for those on *P. flexilis* being 0·5 to 1, 0·1 to 0·3, and 0·1 to 0·15 mm., respectively; they are orange at first, later pale to whitish-yellow, and produce concatenate, cylindrical, smooth teleutospores, orange at the base, nearly hyaline at the apex, 50 to 65 by 17 to 24 μ; the globose basidiospores measure 16 to 20 by 14 to 18 μ.

Mielke (J. L.). **Spread of blister rust to Sugar Pine in Oregon and California.**—*J. For.*, xxxvi, 7, pp. 695–701, 1 fig., 1 map, 1938.

In 1936 white pine blister rust (*Cronartium ribicola*) [*R.A.M.*, xvi, p. 73] was detected for the first time on sugar pines (*Pinus lambertiana*) in Oregon and California and also on *Ribes* in the latter State, where all foci of infection on both hosts were situated in the extreme north-west, close to the Oregon boundary line. No new sugar pine infection centres were recorded for either State in 1937, but there was a considerable extension of the disease on *Ribes* in a southerly direction for about 125 miles in both the coastal and the Sierra Nevada mountains. In general, the development of the rust on *P. lambertiana* follows a similar course to that already studied on *P. monticola* [ibid., xvii, p. 360], previous experimental evidence as to the high degree of susceptibility of the former having been confirmed. As in earlier tests, *R. cruentum* [ibid., xvii, p. 639] and *R. nevadense* were found to be very susceptible to *C. ribicola* (the former, in fact, being probably mainly responsible for its establishment), while *R. glutinosum* is strongly resistant. The rust may be expected to continue its progress into and through California.

Fischer (H.). **Die Douglasienschütte.** [Needle-fall of Douglas Firs.]—*Blumen- u. PflBau ver. Gartenwelt*, xlii, 28, pp. 331–332, 1 fig., 1938.

This is a semi-popular account of the needle-fall of Douglas firs (*Pseudotsuga taxifolia*) caused by *Rhabdocline pseudotsugae* [*R.A.M.*, xvii, p. 361], the increasing prevalence of which in Germany necessitated the exclusion from cultivation by the horticultural authorities in 1936 of all 'mountain' forms of the tree (vars. *glauca* and *caesia*) in favour of the resistant *viridis* [ibid., xvi, p. 507]. Under forest conditions direct control is scarcely practicable, but in the nursery good results have been obtained by applications of 1 per cent. Bordeaux mixture plus tezet [ibid., xvii, p. 682] (200 gm. per 100 l.) or alum (150 gm. per 100 l.) at ten-day intervals from the beginning of May to the end of June.

Němec (A.). **Symptoms of phosphoric acid deficiency in young Pines.**—*Superphosphate*, xi, 7, pp. 121–126, 1938. [French and German translations.]

Further details are given of the pathological condition associated with phosphoric acid deficiency in young pines in various localities of Czechoslovakia [*R.A.M.*, xvi, p. 357], and of successful experiments in its control by the application to the soil, a fortnight before planting,

of superphosphate or basic slag in doses corresponding to 1·2 kg. phosphoric acid per 100 sq. m.

SCHMITZ (H.). & KAUFERT (F.). **Studies in wood decay, VII. How long can wood-destroying fungi endure immersion in water?**—*Proc. Amer. Wood Pres. Ass.*, xxxiv, pp. 83–87, 1938.

Trametes serialis, *Lentinus lepideus*, and *Lenzites trabea* growing in Norway pine [*Pinus resinosa*] sapwood [*R.A.M.*, xvii, p. 783] blocks were found to survive immersion in water for over 38 weeks at 72° F., whereas *Polyporus anceps* succumbed in 44 days under like conditions.

HIRAYAMA (S.). **Studies on the metabolism of some wood-destroying fungi.**—*Ann. phytopath. Soc. Japan*, viii, 1, pp. 9–21, 1 diag., 1938.

Details are given of the writer's studies on the metabolism (with special reference to aerobic and anaerobic respiration) of ten wood-destroying fungi, viz., *Fomes applanatus* [*Ganoderma applanatum*: *R.A.M.*, xvii, p. 713], *F. pinicola* [see above, p. 2], *F. ulmarius* [ibid., xiv, p. 532], *Polyporus betulinus* [ibid., xvii, p. 567], *P. japonicus* [ibid., xi, p. 812], *P. orientalis* [ibid., xi, p. 614], *P. schweinitzii* [ibid., xvii, p. 358], *P. sulphureus* [ibid., xvii, p.786], *Polystictus pergamenus* [ibid., xvi, p. 138], and *P. sanguineus* [ibid., xv, p. 521]. The experimental methods followed were those described by Tamiya (*Acta phytochim.*, iv, pp. 78, 227, 1928–9; vi, p. 1, 1932) and are here presented in detail.

All the organisms were found to be capable of utilizing for respiration and development the various sugars, both hexoses and pentoses (representative of the simpler carbohydrates into which the cellulose component of wood is broken up in the first stage of decay), when added to the synthetic nutrient medium. Lignin-destroying fungi can digest lignin and can presumably decompose the aromatic nucleus and aliphatic carbohydrates which constitute the two major groups of constituents of lignin. In the experiment recorded in this paper it was found that most of the phenolic derivatives are unavailable for respiration, and their general toxicity to wood-destroying fungi was confirmed, e.g., catechol, chinon, and salicylic and benzoic acids acting with particular severity on all the fungi tested. Tannic acid was found to be generally toxic to wood-destroying fungi at a concentration of M/50. On the other hand, certain compounds seemed to be toxic to some fungi and beneficial to others, parahydroxybenzoic acid, for instance, being injurious both to *Polyporus japonicus* and *P. schweinitzii* but assimilable by *Polystictus sanguineus*. Some of the wood-destroying fungi are therefore able to decompose the benzene nucleus and utilize the aromatic compounds as a carbon source for the maintenance of life. Differences in the capability of fungi to utilize the carbon source may possibly account for the specificity of the fungi in the decay of wood. The cellulose-destroying representatives of the group under observation (*F. pinicola*, *F. ulmarius*, *Polyporus betulinus*, *P. schweinitzii*, and *P. sulphureus*) showed a greater capacity for anaerobic respiration than the other five, the activities of which are mainly centred on the destruction of lignin.

CARSWELL (T. S.) & NASON (H. K.). **Properties and uses of pentachlorophenol.**—*Industr. Engng Chem.*, xxx, 6, pp. 622–626, 4 figs., 2 graphs, 1938.

Pentachlorophenol and its sodium salt (sodium pentachlorophenate) have been tested by the standard wood-block method for the control of a number of wood-destroying or -staining fungi [which are specified] and found to compare very favourably for the purpose in view with β-naphthol and *p*-chloro-*m*-cresol. A number of other fungi included in the tests were also effectively combated by the two substituted phenols.

For long-term wood preservation (the largest single use for pentachlorophenol), pressure impregnation with a 5 per cent. solution in a petroleum solvent, such as a fuel oil distillate, is advocated. The disinfected material retains its natural appearance and colour, is practically odourless, and may be painted as easily as untreated wood. Finished millwork, e.g., window sashes and frames, may be satisfactorily treated by a 3- to 5-minute dip in a solution of the same strength. Even brush-treating, which cannot ordinarily be relied upon to confer adequate protection, has given promising results in the case of southern yellow pine [chiefly *Pinus palustris*] boards infected by *Lenzites trabea*.

Pentachlorophenol is a white solid, forming acicular crystals with a crystallizing point of 190·2° C. It is only slightly soluble in water, practically insoluble in aqueous ammonia solution, but tends to form supersaturated solutions in many organic solvents. Its very low vapour pressure at ordinary temperatures is of great advantage for purposes in which lack of volatility is essential.

BUCHHOLTZ (W. F.). **Factors influencing the pathogenicity of Pythium de Baryanum on Sugar Beet seedlings.**—*Phytopathology*, xxviii, 7, pp. 448–475, 3 figs., 4 graphs, 1938.

Failure of sugar beet stands in acid (below P_H 6·5) soils at moderately high soil temperatures in northern Iowa has been found to be predominantly (over 95 per cent.) due to damping-off by *Pythium de Baryanum* [*R.A.M.*, xvii, p. 496], though *Phoma betae* [loc. cit.] and *Rhizoctonia* [*Corticium solani*: ibid., xvii, p. 498] are also pathogenic to greenhouse seedlings. *Pythium de Baryanum* causes a generalized necrosis of any part of the germinating and emerging seedling, and cortical necrosis of somewhat larger plants. In the writer's experiments it has been a much more vigorous parasite than *Phoma betae*, the slow cortical necrosis due to which is frequently overcome by affected seedlings without the development of any above-ground symptoms; neither this organism nor *C. solani* is of appreciable importance on field-grown seedlings. The diameters of the conidia, oogonia, and oospheres and oospores of the sugar beet strain of *P. de Baryanum* were 10 to 35, 16·6 to 22·1, and 13·6 to 17 μ, respectively.

In pure culture *P. de Baryanum* made scanty growth below 15° C., and at relatively low soil temperatures it is not actively pathogenic to sugar beet seedlings. Two cultures of the fungus developed uniformly well at a P_H range of 4·7 to 7·3.

In field experiments continued heavy dressings of sugar factory lime cake increased slightly the number of emerging seedlings but noticeably

raised the percentage of survival. A combination of early planting (29th April to 1st May) and seed treatment with 5 per cent. ethyl mercuric phosphate, 4 to 7 oz. per 100 lb., considerably improved the condition of affected stands, but no single practice afforded complete control of the disease.

KREUTZER (W. A.) & DURRELL (L. W.). **Rot of mature tap root of Sugar Beet caused by Pythium butleri.**—*Phytopathology*, xxviii, 7, pp. 512–515, 2 figs., 1938.

A species of *Pythium* isolated in 1936 from the yellow to brown tissues of a relatively firm rot of sugar beet tap-roots in Colorado was characterized by oogonia and oospores averaging, respectively, 24 and 20·5 μ in diameter, and is referred on the authority of C. Drechsler to *P. butleri* [*R.A.M.*, xiii, p. 399]. External symptoms of the disease included extensive foliar wilting, chlorosis, and necrosis, and a dull brown, mottled discoloration of the roots, in the parenchymatous tissues and vessels of which the pathogen was present in profusion. It is not clear whether the beet-rotting fungus described by H. A. Edson as *Rheosporangium aphanidermatus* (generally known as *P. aphanidermatum* [loc. cit.]) in *J. agric. Res.*, iv, pp. 135–168, 279–292, 1915, is identical with the one under observation, but in any case the disease here reported is materially distinct, notably in the injury to the tap-roots, from the earlier trouble.

BROWN (H. D.). **Cercospora control by spray and dust.**—*Proc. Amer. Soc. Sug. Beet Technol., 1938*, pp. 57–60, 1938. [Abs. in *Facts ab. Sug.*, xxxiii, 8, pp. 35–36, 1938.]

In the sugar beet-growing territory owned by the Canada and Dominion Sugar Company, where infection by *Cercospora* [*beticola*: *R.A.M.*, xvii, p. 719] has been severe in four years out of eight, crop rotation is now required by contract. Leaving beet tops on the field is regarded as a definite contributory cause of infection, and farmers are encouraged to silo the debris and use it as fodder. Since 1933 spraying and dusting experiments with Bordeaux mixture and copper-lime dusts have been conducted with highly satisfactory results, dusting being significantly the more effective and economical of the two. Three applications of dust require about 100 lb. material per acre, and the cost is equivalent to $\frac{2}{3}$ ton of beets or 1·5 per cent. more sugar in the average crop yield.

WADE (B. L.) & ZAUMEYER (W. J.). **Varietal reaction of Pea to a virus from Alsike Clover.**—*Phytopathology*, xxviii, 7, pp. 505–511, 1938.

Twenty-four of the 145 pea varieties and strains tested under field conditions in Colorado in 1935 and 1936 for their reaction to alsike (*Trifolium hybridum*) virus 1 [*R.A.M.*, xvi, p. 84] remained entirely free from infection in both years, while seven were completely susceptible. Among the resistant lines were American Wonder, Ashford, Delikatess, Nott's and Sutton's Excelsior, Horal, Little Marvel, five types of Perfection, Premium Gem, and Surprise. There was a considerably higher level of survival in 1935 than in 1936, due to the more favourable environmental conditions for the crop in the former year,

but in general the varieties ranking high in 1935 were rated fairly high in 1936.

PUGSLEY (A. T.). **Root rot of Onions.**—*J. Dep. Agric. Vict.*, xxxvi, 7, p. 320, 2 figs., 1938.

Fusarium root- or bulb-rot of onions [*R.A.M.*, xv, p. 777] every year causes progressively greater losses in Victoria. The chief factor in control consists in adequate sanitary precautions. Diseased onions should be burnt, and crop rotation practised. The practice of cleaning up diseased refuse in paddocks by turning cattle in is strongly deprecated. The crop should be promptly gathered after harvest, carefully sorted before storage, and arranged in well-ventilated stacks.

ZAUMEYER (W. J.). **A heritable abnormality of Beans resembling mosaic.**—*Phytopathology*, xxviii, 7, pp. 520–522, 1938.

Bean [*Phaseolus vulgaris*] plants (chiefly hybrids with Corbett Refugee as one of the parents) in Maryland are liable to develop a mosaic-like foliar variegation characterized by an almost complete absence of chlorophyll, resulting either in cessation of growth or stunted development, with distorted leaves and pods, sometimes accompanied by rosetting. Genetic data from crosses between Corbett Refugee and several varieties are given showing that the disorder is heritable and not due to virus infection.

SCHULTZ (H.) & RÖDER (K.). **Die Anfälligkeit verschiedener Varietäten und Sorten von Salat (Lactuca sativa L. und Lactuca scariola L.) gegen den falschen Meltau (Bremia lactucae Regel).** [The susceptibility of different varieties and types of Lettuce (*Lactuca sativa* L. and *Lactuca scariola* L.) to downy mildew (*Bremia lactucae* Regel).] —*Züchter*, x, 7, pp. 185–194, 1938.

A fully tabulated account is given of three years' (1935 to 1937) field observations at the Grossbeeren (Teltow) branch of the German Biological Institute on the reaction to downy mildew (*Bremia lactucae*) [*R.A.M.*, xvii, p. 289] of a large number of lettuce (*Lactuca sativa*) varieties of the head (var. *capitata*), cutting (var. *secalina*), picking (var. *aurescens*), summer endive (var. *longifolia*), asparagus (*L. scariola* f. *integrifolia*), and wild (Central Asian) types, supplemented by a series of greenhouse inoculation experiments in 1936–7 on 64 varieties. As regards the head type, satisfactory resistance in the field was shown by Maikönig and Böttner's forcing varieties, with mean infection values of 1·1 and 1·5, respectively (1 representing absence of infection and 5 a high incidence), closely followed by Buse's Brown (1·7); by the early varieties Maikönig (2·1), Augsburg, Bismarck, Naumburg, and Suabian (2·3), Allerfrühster gelber (2·3), Express (1·9), Hamburg Market (2·1), Grosser früher gelber (2·3), and Herzenas, Hochheim Dauerkopf, and Riesengelber (2·3); and by the summer varieties Riesenkristallkopf (2·1), Essling Brown Market, Goldforellen, Graf Zeppelin, Heilbronn, and Wunder der Jahreszeiten (2·3), Bonn Silberkopf and Fürchtenichts (2·4), Graz Krautkopf, Laibach Eis, Wunder von Marbach, and Venlo Butterkopf (1·9), Imperial Yates, Hungarian Hitzkopf, and Wunder von Vorberg (1·7), the three last-named varieties, however, together

with Yaramoundi (no infection) having been tested in 1937 only. The cutting types are generally only slightly infected; among the most resistant varieties in the field were Delikatess and Mooskrauser (2·3), the same value being obtained for two representatives of the picking type, American Brown and Australian Yellow. A high degree of susceptibility was manifested by the summer endive varieties (3·4 to 4·4 average of all for the three years), and similar observations were made in respect of the asparagus type. Except in 1936 the five Central Asian strains proved fairly resistant.

The important bearing of temperature and atmospheric humidity on the development of the disease is discussed [loc. cit.]. In connexion with the latter factor it is stated that no new lesions were formed on plants in the open during the second half of June, 1936, when hot (mean temperature 20° C.), practically rainless conditions prevailed, whereas numerous fresh sporangia were produced immediately following thunder rain on 1st July, indicating that the fungus had gained a foothold at an earlier stage but was unable to fructify until the atmosphere was sufficiently damp (96 per cent. relative humidity).

In the greenhouse inoculations the reactions of older plants were similar to those displayed in the field, though the symptoms of infection tended to be more intense. Young plants were uniformly susceptible, whatever their behaviour in the field. The wild varieties, *L. virosa* and *L. scariola*, reacted to downy mildew infection similarly to the cultivated types. In the course of these tests two physiologic races of *B. lactucae* were differentiated, one (D) being non-pathogenic to Hindenburg, Maiwunder, Frühlingswunder, Viktoria Forcing, and Wehrden, whereas the other, (G), attacked all varieties with uniform severity but spared a few individuals, more especially within such ordinarily susceptible varieties as Bautzen Dauerkopf, encouraging the hope of eventually securing resistant strains by a process of mass selection.

CAYLEY (D[OROTHY] M.). **The history of the cultivated Mushroom.**—*Gdnrs' Chron.*, civ, 2690, pp. 42–43, 3 figs. (1 on p. 39), 1938.

The author briefly surveys the history of the cultivated mushroom in France, Britain, and the United States, the earliest French record dating from 1678. Contrary to the commonly accepted view, she considers that the cultivated mushroom does not owe its origin to *Psalliota campestris* but is probably derived from a manure-inhabiting species.

CAYLEY (DOROTHY M.). **Mushrooms.**—*J. R. hort. Soc.*, lxiii, 7, pp. 325–333, 1938.

Most of the results of the author's study on the growth of the cultivated and the wild species of mushroom on artificial composts have already been noticed from other sources [*R.A.M.*, xvii, p. 648]. In the present paper the author states that on unfermented sterilized composts of moistened chopped straw, chopped hay, and sand with or without oats, both wild grassland [including *Psalliota campestris* and *P. arvensis*] and wild haystack mushrooms [*P.* sp.] and cultivated forms [*P.* spp.] grew vigorously, and the mixture with crushed oats and nutrient solution added has been adopted as a standard spawn-growing

compost. All attempts have so far failed, however, to grow the wild grassland species on either fermented or naturally rotted composts under ordinary cultural conditions, while the wild haystack mushroom, a species excellent in flavour and consistency, was found to grow rapidly and to fructify on a cheap mixture of naturally rotted material with one-half to one-third the volume of soil. It may be possible to bring this form into cultivation, but it will not tolerate fermentation accompanied by the generation of heat, and requires artificial heating. The labour and the costs entailed in cultivating this species will, it is thought, compare very favourably with the present-day practice of growing mushrooms on composted stable manure.

SINDEN (J. W.). **Synthetic compost for Mushroom growing.**—*Bull. Pa agric. Exp. Sta.* 365, 27 pp., 2 figs., 1938.

In experiments recorded in this paper six variations of synthetic composts for mushroom [*Psalliota* spp.] growing [see preceding abstracts] were compared in five replications at the experimental mushroom house at the Pennsylvania Agricultural Experiment Station. The compost piles usually consisted of 500 lb. dry straw, to which other ingredients were added, and the yields of mushrooms were computed on the basis of pounds of mushrooms per ton of manure or synthetic material used. In tests with horse manure it was found that droppings are not essential for the growth of mushrooms, since the yields from composts containing either droppings or bedding straw, or with various combinations of the two, did not differ significantly. In tests with synthetic composts, that made up in the proportion of 482 lb. wheat grain and 22 lb. urea per ton of straw produced 444 lb. mushrooms per ton of straw used, approximately two-thirds as much as a control compost of horse manure. The presence of wheat caused a more rapid decomposition. A computation of yields from piles with different amounts of wheat showed that the addition of much wheat grain is unprofitable, whereas the use of some grain is beneficial. The addition of increasing amounts of urea increased the rate of decomposition of the synthetic composts, 32 lb. urea per ton of straw being, however, the maximum quantity which may be added advantageously at one time. When larger amounts of urea were added the rate of decomposition decreased. The piles composted 21 and 25 days produced more mushrooms than those composted longer, the increasing loss of total organic matter during the composting process being the principal cause of the gradual decrease in yield. A provisional formula for synthetic compost for the use of the mushroom grower is outlined as follows. In order to ensure rapid decomposition the straw should be watered during spreading and trampled down as it is distributed; the finished piles should be 4 to 5 ft. high and solidly packed throughout. After four days the pile should be turned for the first time and urea added (at the rate of 28 lb. per ton of dry straw) by sprinkling it (as a solution of 1 lb. per gal.) during turning and trampling. Water may be added during the process but not in excess. At the second turning four days later wheat soaked over-night in water should be added evenly at the rate of not more than 400 lb. per ton of dry straw. Sufficient water may be added to keep the pile wet. After turning, the pile should be compacted by

walking over the top. For the third time the pile should be turned like manure after adding water and not trampled down. Four days to a week later the beds should be filled 7 in. deep and packed quite firmly. The house should be kept hot long enough to kill the insects and the spawn planted when the temperature drops to 75° or 80° F. The finished compost is similar in texture and odour to composted horse manure but is of greater bulk per unit weight.

Castel (P.) & Bosc (M.). **Sur la localisation du cuivre dans les tissus foliaires de la Vigne après traitement au sulfate de cuivre.** [On the localization of copper in the foliar tissues of the Vine after treatment with copper sulphate.]—*C.R. Acad. Sci., Paris*, cvii, 2, pp. 179–181, 1938.

With the aid of various reagents the authors examined samples of vine leaves collected at intervals of a few days to two months after spraying with copper sulphate against downy mildew [*Plasmopara viticola*], and ascertained that the fungicide was localized on the cuticle and had not penetrated the underlying tissues.

Sarejanni (J. A.). **Notes phytopathologiques II.** [Phytopathological notes II.]—*Ann. Inst. phytopath. Benaki, Greece*, ii, 2, pp. 86–92, 1936. [Received November, 1938.]

A Latin diagnosis is given of *Septoriella oleae* n.sp., frequently found in association with *Macrophoma dalmatica* on prematurely fallen olive fruits [*R.A.M.*, xvi, p. 546] in various parts of continental Greece. The infected olives may be either green or black, shrivelled, and wrinkled, the entire surface covered with minute fissures, similar to those produced by *Gloeosporium olivarum*, along which are borne masses of black pycnidia, 0·5 to 1 mm. in diameter, up to 6-loculate, and lined with filiform, hyaline, straight or sinuous conidiophores, 24 to 44 by 2 μ, bearing at their apices subfusoid or oblong, straight or slightly falcate, hyaline, guttulate, uni- to biseptate conidia, 15 to 30 by 4 to 6 μ. Like *M. dalmatica*, *S. oleae* is a secondary parasite, entering the fruits through injuries inflicted by the olive fly, *Dacus oleae*. The disease reaches a climax in August, so that the new pathogen is evidently capable of survival at fairly high temperatures.

Loquats in the Lamia district were very severely attacked, during a damp and rather cold spell in April, 1937, by *Sclerotinia laxa*, apparently not recorded hitherto on this host. The loquat is also believed to be a new host for *Botrytis cinerea*, which was prevalent on the fruit at the same time in the gardens of Kiphissia. *S. sclerotiorum* occurred in a destructive form on Vines at the end of March, 1936, in a group of islands near Chio, attacking the young shoots as they reached a length of 40 to 50 cm. [ibid., xiii, p. 746]; the fungus is widespread on figs in the Peloponnesus.

In 1933 five- to six-year-old Devino vines growing on a heavy clay soil inundated by floods in a narrow valley near Janina, Epirus, developed pronounced symptoms of court-noué restricted to the tendrils of one or two branches, which shrivelled in August without causing any further damage to the stocks. The disease occurred in

isolated patches in the vineyards and apparently spread through the soil. *Pythium de Baryanum* was isolated from the diseased tissues.

A Latin diagnosis is given of *Microdiplodia capsici* n.sp., the agent of sharply defined, whitish-grey spots, 2 to 3 mm. in diameter, with a yellowish-brown border, on living chilli leaves at Kiphissia. The sparse, ostiolate, black pycnidia of the fungus measure 100 to 125 μ in diameter, and the abundant subellipsoid, straight or slightly curved, uniseptate, olivaceous conidia 8 to 11 by 2 to 3 μ; conidiophores were not observed. The lesions due to *M. capsici* resemble those produced on the same host by *Vermicularia* [*Colletotrichum*] *capsici* [ibid., xv, p. 344].

Ballard (E.). **Report of the Chief Plant Protection Officer for the year ended 31st March, 1938.**—*Rep. Dep. Agric. Palestine, 1937–8*, pp. 71–73, 1938.

In this report *Puccinia antirrhini* is recorded as developing in a destructive form [on *Antirrhinum majus*] in private gardens in Jerusalem and Tel Aviv [cf. *R.A.M.*, xvii, p. 602].

Johnston (C. O.), Lefebvre (C. L.), & Hansing (E. D.). **Kansas mycological notes, 1936.**—*Trans. Kans. Acad. Sci.*, xl, pp. 69–74, 1938.

One of the most interesting developments in Kansas during 1936 [cf. *R.A.M.*, xvii, p. 16], from the standpoint of applied mycology was the exceptionally heavy incidence of smuts on oats (*Ustilago avenae* and *U. levis* [*U. kolleri*]), 25 per cent. of panicle infection being frequently observed, while counts of 86 and 98 per cent. were also reported. *U. avenae* has long predominated under local conditions, but during 1936 there was an unusual abundance of *U. kolleri*. Bacterial blight of smooth brome grass (*Bromus inermis*), caused by *Bacterium coronafaciens atropurpureum*, was prevalent after rainy weather towards the end of April and was followed by severe infection by *Septoria bromi*, the pycnidia of which almost covered many of the leaves. Evidence was obtained of individual resistance to *Puccinia andropogonis* among the very nutritious fodder grasses, *Andropogon furcatus* and *A. scoparius*, and a similar reaction to *Sorosporium everhartii* was observed in the case of *A. furcatus*, apparently a new host. Other noteworthy records on grasses include *S. provinciale* on *A. furcatus* and *Sphacelotheca andropogonis* on *A. scoparius*. Lucerne was infected by *Ascochyta imperfecta* [ibid., xvi, p. 258]. Chinese elm (*Ulmus pumila*) leaves were attacked by *Gnomonia ulmea* [ibid., xiv, p. 203]. Severe damage to privet was caused by *Glomerella cingulata* [ibid., ix, p. 654].

Bouriquet (G.). **Madagascar: A list of parasites and diseases of cultivated plants.**—*Int. Bull. Pl. Prot.*, xii, 9, pp. 191–192, 1938.

The following are among the records comprised in this continuation (extending to March, 1938) of the writer's list of Madagascan plant parasites and diseases [*R.A.M.*, xvi, p. 590]: *Sphaerotheca pannosa* on peach, *Leveillula* [*Oidiopsis*] *taurica* on eggplant [ibid., v, p. 20; xvii, p. 217], and *Spongospora subterranea* on potato.

Franco (R. M.). **Enfermedades de la Papa, Algodón, Arroz, Cabuya, Caña, y Cacao.** [Diseases of Potato, Cotton, Rice, Agave, Sugar-Cane, and Cacao.]—*Agricultura, Bogotá*, x, 12, pp. 344–356, 1938.

Popular notes are given on the following diseases and their control in Colombia: *Corticium vagum* [*C. solani*], *Sclerotinia sclerotiorum*, *Spongospora subterranea*, *Alternaria solani*, and *Puccinia pittieriana* [*R.A.M.*, xiv, p. 325] on potatoes; *Bacterium malvacearum*, gummosis (*Bacillus gossypinus* and *Gibberella saubinetii*), and *Cerotelium desmium* [ibid., xvii, p. 98] on cotton; *Helminthosporium oryzae* [*Ophiobolus miyabeanus*] and *Piricularia oryzae* on rice [ibid., xvi, p. 202]; *Colletotrichum agaves* [ibid., xvii, p. 322], *Coniothyrium* (?) *concentricum* [ibid., xii, p. 550], and *Corticium salmonicolor* on *Fourcroya* [*Furcraea*]; mosaic [ibid., xvi, p. 711] and *Sclerotium rolfsii* on sugar-cane; and *Diplodia cacaoicola* [*Botryodiplodia theobromae*: ibid., ix, p. 437] and *Colletotrichum* on cacao.

Winkelmann (A.). **Die Entwicklung der Lohnbeizkontrolle in Westfalen und ihre Bedeutung für die landwirtschaftliche Praxis.** [The development of supervision of commercial seed-grain disinfection in Westphalia and its importance in agricultural practice.]—*Kranke Pflanze*, xv, 9, pp. 145–149, 1938.

The commercial seed-grain disinfection depots in Westphalia [cf. *R.A.M.*, xvii, p. 509] were put under State supervision in 1930–1, when of the existing 189 only 111 were found to be adequately equipped and were officially approved. Within a year the percentage of insufficiently treated seed samples fell from 80 to 40 and thereafter was gradually reduced to 16·6 in 1936. In 1937 there existed 485 officially approved depots, about 40 per cent. being in the hands of millers. The short disinfection process is steadily gaining ground, the number of depots provided with appropriate equipment having risen from 8 in 1934 to 130 in 1937.

Selariès [P.] & Rohmer [G.]. **Essais sur la carie du Blé en Alsace.** [Experiments on Wheat bunt in Alsace.]—*Ann. Épiphyt.*, N.S., iii, 2, pp. 175–185, 1937. [Received October, 1938.]

In tests of the chief wheat varieties grown in Alsace for susceptibility to bunt (*T. tritici* [*T. caries*] only) a strain of *T. caries* from Dijon was used in 1929 to infect Alsace 22, Bordeaux 115, and Squarehead 240 and the bunt transferred to the same varieties a year later. The results obtained from the 1930 inoculations showed that the three varieties had, respectively, 28·9, 11·6, and 11·4 per cent. bunted plants and 18·2, 7, and 6·7 per cent. bunted ears, the corresponding figures for Vilmorin 27 (used for comparative purposes) being 43 and 33·2 per cent. In the same experiment heavily infected seed of these varieties was dusted with cupric chloride+talc, copper oxychloride, and copper carbonate, each used at the rate of 250 gm. per 100 kg. of seed, or was immersed for one hour in a 0·5 per cent. solution of copper sulphate (followed by dusting with slaked lime) or for 15 minutes in a 0·25 per cent. solution of commercial formalin. The formalin treatment gave complete control, while the dust treatments showed infection ranging from 2·6 to 6·6, 0·7 to 3·9, and 1·6 to 4·8 per cent. bunted ears, respec-

tively, and from 4·2 to 14·7, 0·9 to 8·1, and 2·6 to 8 per cent. bunted plants, respectively. The copper sulphate and lime gave 0·1 to 3·2 per cent. bunted ears, and 0·8 to 5·5 per cent. bunted plants.

Certain races of *T. caries* from other localities were more virulent to the local wheat varieties than were the local races of the fungus, but the passage of a given race to a variety known to be resistant did not appear to increase its virulence towards the local wheats.

Crépin (C.), Bustarret (J.), & Chevalier (R.). **Le problème de la création des Blés résistants à la carie.** [The problem of the development of Wheats resistant to bunt.]—*Ann. Épiphyt.*, N.S., iii, 3, pp. 323–439, 1937. [Received October, 1938.]

In this paper the authors review in detail the information so far available on the development of resistance to wheat bunt (*Tilletia caries* and *T. foetens*) and give a full account of preliminary work carried out by them on this problem at Dijon from 1927 to 1936. It appears that the only species of *Tilletia* present in France is *T. caries*, although in northern Africa the more prevalent bunt organism is *T. foetens*. In areas where both fungi are present hybrid types are found.

In the climatic conditions prevailing in France, sowings made in the rather late autumn or rather early spring are the most likely to show a high rate of infection. Optimum conditions for infection are set up when the soil temperature lies between 5° and 12° C. at sowing time and during the three or four following weeks. Average soil humidity, a well-aerated soil, and somewhat deep sowing also favour infection. Some varieties resistant to infection when sown in spring become susceptible when sown in autumn. In some cases a form of latent infection is set up, in which modifications occur in the vegetative parts, but no spores are formed in the ears.

At least two types of resistance appear to exist. In some cases the fungus is able to penetrate only the external tissues of the host, where it soon dies. In others it reaches the growing point and develops more or less readily in the tissues but either it does not fructify (latent infection) or it does so with difficulty (partial infection). The environmental conditions of the host are of no importance for varieties possessing, for any given form of bunt, the former type of resistance, but they may markedly affect the apparent resistance of varieties showing the latter type. Resistance in either case is a varietal character, falling into the category of 'physiological immunity' and is related to hereditary factors.

Observations at Dijon demonstrated that the hereditary transmission of bunt resistance does not take place in the same way in all resistant varieties. Resistance to bunt is a character entirely independent of other morphological or physiological characters. Resistance to any given race of bunt is rarely simple, two or more factors being involved in most cases. Two wheats resistant to the same race of bunt need not necessarily possess the same factors for resistance, and, furthermore, in a given wheat resistance to several races of bunt may be governed by different factors. This multiplicity of factors accounts for the large number of 'types of resistance' observed. Starting with highly susceptible French wheats and resistant foreign wheats the authors have

developed by hybridization new wheats of the French type which are as resistant to bunt as their resistant parent.

The physiologic races of *T. caries* occurring in France do not appear to show high virulence, and do not, for the most part, infect the Hussar variety.

Starr (G. H.). **Field experiments on bunt of Wheat.**—*Bull. Wyo. agric. Exp. Sta.* 226, 23 pp., 7 figs., 1938. [Abs. in *Exp. Sta. Rec.*, lxxix, 4, p. 353, 1938.]

In field experiments on wheat bunt in Wyoming from 1932 to 1936, *Tilletia levis* [*T. foetens*] was found to be much more prevalent than *T. tritici* [*T. caries*] as an agent of the disease. Seed-borne infection was best controlled by ceresan and formaldehyde, the latter, however, being liable to injure the seed-grain. Copper carbonate and coppercarb were about equally effective, neither reaching the standard of the two foregoing. The average incidence of bunt in early plantings was 78·3 per cent., with a progressive decline in subsequent sowings down to 11·5 per cent. in late ones. Temperature relations thus appear to be of great importance in the development of *T. foetens*. In general, more bunt occurred in irrigated (37·6 per cent.) than in non-irrigated plots (26·9). Soil infestation did not appear to play an important part in the causation of the disease, except possibly in 1935.

Hely (F. W.), Allan (F. E.), & Angell (H. R.). **Bunt infection and root development in Wheat.**—*J. Coun. sci. industr. Res. Aust.*, xi, 3, pp. 254–255, 1938.

In pot experiments on Nabawa wheat, susceptible to bunt (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*] the root growth of eight-week-old plants grown from grain inoculated with *T. caries* and *T. foetens* was considerably reduced, the mean weight of dry roots per pot being 1·05 gm. for the inoculated plants and 1·30 gm. for the uninoculated control. The slight depression in the weight of the tops was not significant.

Angell (H. R.), Allan (F. E.), & Hely (F. W.). **The effect of Urocystis tritici Koern. on the extent of development of the roots and aerial parts of the Wheat plant. II.**—*J. Coun. sci. industr. Res. Aust.*, xi, 3, pp. 256–257, 1938.

Further experiments on the effect of *Urocystis tritici* on the development of tops and roots of wheat plants of the varieties Nabawa (highly resistant), Ford (moderately resistant), and Federation (very susceptible) brought further confirmation of the results previously obtained [*R.A.M.*, xvi, p. 664]. The inoculations resulted, in all experiments except one (made in late summer and probably affected by high temperature after germination), in a significant reduction of root and top growth of all varieties, the top development being, however, in one experiment less marked in Nabawa than in the others.

Allen (P. J.) & Goddard (D. R.). **Changes in Wheat metabolism caused by powdery mildew.**—*Science*, N.S., lxxxviii, 2278, pp. 192–193, 1938.

With the aid of a Fenn micro-respirometer (*Amer. J. Physiol.*,

lxxxiv, p. 110, 1928), the writers were able to measure separately the respiration and fermentation of wheat infected by powdery mildew (*Erysiphe graminis tritici*) [*R.A.M.*, xvii, p. 806]. Normal plants were heavily inoculated ten days after planting, and the first leaf used for experimental work 7 to 8 days later. By carefully scraping away all the leaf tissue except the lower epidermis, the latter may be obtained as a strip a single cell thick, with the large-lobed haustoria of the pathogen uninjured. Determinations on 5 sq. cm. of normal epidermis gave no respiration within the limits of the apparatus (± 0·05 cu. mm. oxygen per sq. cm. surface per hour), whereas with a similar area of mildewed epidermis the oxygen consumption amounted to 1·3 cu. mm. per sq. cm. surface per hour. On removal of the mildew from the epidermis with a camel-hair brush the oxygen consumption disappeared and consequently oxygen consumption is a measure of mildew respiration. On the other hand, the respiration of infected wheat was increased 250 per cent. above the normal and the removal of the mildew from the plant with a camel-hair brush failed to induce a reversion to the normal level of respiration. A 0·001 molar solution of sodium azide nearly inhibited the respiration of the fungus while leaving that of normal wheat virtually unimpaired, and treatment of mildewed wheat with this substance caused a decrease in respiration corresponding to that of the mildew, indicating that the host is predominantly concerned in the increased respiration associated with infection. An increase of some 50 per cent. in host fermentation [as measured by anaerobic carbon dioxide production] was caused by the disease. These changes in the host metabolism occur in the green mesophyll cells which are not in actual contact with the fungus. The destruction of functional chlorophyll appears, from preliminary measurements of the effect of mildew on photosynthesis, to take place subsequently to the modifications in fermentation and respiration under observation.

RUNGE. **Beobachtungen zur Halmbruchkrankheit des Weizens 1938 (Cercosporella herpotrichoides).** [Observations on the straw-breaking disease of Wheat in 1938 (*Cercosporella herpotrichoides*).]—*Dtsch. landw. Pr.*, lxv, 33, p. 421, 2 figs., 1938.

Observations in the Schmatzin district of Germany in 1938 showed that not only the crop immediately preceding wheat exerts an influence on the extent of the damage caused by *Cercosporella herpotrichoides* [*R.A.M.*, xv, p. 783] but also the one before that. A particularly deleterious rotation was winter barley-potatoes-wheat, the last-named being lodged to the extent of 90 per cent. Winter barley preceding rape was somewhat less injurious, but the following wheat crop sustained 50 per cent. injury. Summer wheat preceding potatoes also exercised an adverse effect on the following wheat crop, whereas summer barley was more advantageous in this respect.

UTTER (L. G.). **Culture and inoculation studies on races of the loose and covered smuts of Oats.**—*Amer. J. Bot.*, xxv, 3, pp. 198–210, 1 pl., 1938.

Cultural studies are described with eleven physiological races of the loose smut and seven of the covered smut of oats (*Ustilago avenae* and

U. levis [*U. kolleri*: *R.A.M.*, xvii, p. 738]), obtained by Reed and established as distinct physiologic races by their constant pathogenicity. The size, colour, and topography of the growths of single sporidia, single chlamydospore, and dilution cultures were determined for 274 triplicate culture sets of the former smut and 307 of the latter. Approximately 60 per cent. of all the sets of both smuts showed dissimilarities and successive culture generations failed to remain constant in character, regardless of the isolation method used. The single sporidial cultures of either smut could be roughly grouped, on the basis of colour and certain topographical characteristics, into four classes, whereas the dilution and the single chlamydospore cultures varied so much in size and colour that they could not be grouped. Similarities or dissimilarities between the different races of either smut and between the races of both smuts could be shown by a careful selection of individual cultures. These dissimilarities were not permanent and were sometimes more pronounced between different isolations of the same race than between two different races. Cultural characteristics were thus found unreliable as means of identification of the smut races.

In inoculation experiments single sporidial cultures of the two smuts (race 1 of each) failed to produce infection on their respective susceptible host varieties, while single sporidial cultures of the loose smut paired in various combinations produced typical smut symptoms; three combinations of the covered smut gave negative results indicating the 'sexual' similarity of the cultures involved. Two combinations of cultures of loose smut paired with cultures of covered smut produced on the variety Monarch (normally susceptible only to covered smut) a new type of smut having the symptoms and morphological characteristics of the loose smut but the pathogenic qualities of the covered smut; no infection was produced on the variety Gothland (normally susceptible to loose smut). Successive inoculations of differential host varieties with such hybrid chlamydospores from each generation revealed at least sixteen new and distinct smut types exhibiting recombinations of factors for symptoms, morphology, and pathogenicity. Some of these types, which are considered to be new physiologic races, remained constant for their respective characteristics during two or three generations.

VAUGHAN (E. K.). **A race of Ustilago avenae capable of infecting Black Mesdag Oats.**—*Phytopathology*, xxviii, 9, pp. 660–661, 1938.

In 1936 two collections of *Ustilago avenae*, one from Kansas and the other from Oklahoma, produced, respectively, 23 and 30 per cent. smutted heads on the normally resistant Black Mesdag variety [*R.A.M.*, xiii, p. 761; xvii, p. 658]. Each collection was increased on Black Mesdag and Anthony (susceptible) in 1936 and in the following year seven varieties of oats were inoculated with these collections and with two others increased on Anthony and Gopher. Chlamydospores of the two collections produced on Black Mesdag in 1936 were much more severely pathogenic to this variety (84 and 48 per cent. infection from the Oklahoma and Kansas strains, respectively) than those of the same material produced on Anthony (15 and 26, respectively). The Oklahoma (but not the Kansas) collection from Black

Mesdag also caused much heavier infection (76 per cent.) in Double Cross II 20–220 (Minota×White Russian)×Black Mesdag, hitherto resistant, than that from Anthony (3 per cent.). Bond, Markton, and South Dakota No. 165 remained resistant to the new collections irrespective of the variety on which the latter were increased. These data are regarded as confirmatory of previous observations by various workers as to the increase of pathogenicity acquired by a given smut collection towards a normally resistant variety by successive inoculations of the latter owing to the augmented proportion of biotypes capable of developing thereon [ibid., xiii, p. 364 *et passim*].

Rivier (A.). **Contribution à l'étude du traitement du charbon nu de l'Avoine.** [Contribution to the study of the control of loose smut of Oats.]—*Ann. Éc. Agric. Montpellier*, N.S., xxv, 2, pp. 183–192, 1938.

The results of two further years' tests of oat seed-grain treatments for the control of loose smut [*Ustilago avenae*] in France [*R.A.M.*, xv, p. 791] showed that, under the conditions of the experiments, the degree of contamination of the seed-grain (Noire d'hiver de Belgique variety) with smut spores was of greater importance in determining the percentage of smut in the resulting crop than the degree of soil contamination. Among the dust disinfectants tested, almost complete control (0·92, 0, and 0 per cent. infection in three tests) was afforded only by a mixture of 8 parts trioxymethylene and 92 parts talc, the untreated seed yielding 50, 34·61, and 49·4 per cent. smut; the mixture slightly retarded the emergence of oat seedlings and very slightly decreased the percentage germination in the field, but its high fungicidal efficiency warrants the tests being repeated on a larger scale. In the same experiment steeping the oat seed for two hours in a 1 in 2,000 solution of cryptonol [ibid., xvii, p. 182] was almost as effective as steeping for the same time in a 1 in 1,000 silver nitrate solution, the two treatments, in three tests, reducing the percentage of resulting smut to 3·45, 1·98, and 5·94, and to 4·9, 1·08, and 3·63 respectively. The addition of 1 gm. terpenic alcohol [ibid., xvii, p. 500] per l. disinfectant solution markedly increased the fungicidal efficiency of the latter in every case.

Hoppe (P. E.). **Relative prevalence and geographical distribution of various ear rot fungi in the 1937 Corn crop.**—*Plant Dis. Reptr*, xxii, 12, pp. 234–241, 2 graphs, 1938. [Mimeographed.]

A survey of the maize ear rot fungi present in samples of grain of the 1937 crop taken from carloads at terminal markets in the United States [*R.A.M.*, xvi, p. 310] showed the crop to be one of the cleanest on record as regards ear and kernel rot diseases. Throughout the maize belt itself the incidence of *Diplodia zeae* was lower than in any of the previous five surveys, but in the Atlantic seaboard states it was again the principal fungus and was particularly prevalent in Alabama and Mississippi. In samples from southern States the ratio of *D. macrospora* to *D. zeae* was approximately 1 to 30, which agrees well with Larsh's recent observations [ibid., xvii, p. 670]. *Fusarium moniliforme* [*Gibberella fujikuroi*] was the most prevalent fungus in the samples from all States west of the Mississippi, as well as in Illinois, Indiana,

Maryland, Kentucky, and Tennessee. As in previous surveys, *G. saubinetii* was generally confined to the more humid sections of the maize belt east of the Mississippi. Owing to very favourable weather conditions during maturation the incidence of *Nigrospora sphaerica* was low. *N. oryzae* was isolated from a damaged kernel from Iowa.

The ratio of *Aspergillus* to *Penicillium* spp. increased from the humid regions east of the Mississippi to the drier areas to the west of the river [ibid., xvii, p. 519].

Itzerott (Dorothea). **Die Wirkung wuchsstoffhaltiger Substanzen junger Maispflanzen auf das Wachstum von Ustilago zeae.** [The influence of auxin-containing substances of young Maize plants on the growth of *Ustilago zeae*.]—*Arch. Mikrobiol.*, ix, 3, pp. 368–374, 1938.

In experiments at the Phytopathological Institute, Landsberg-an-der-Warthe, Germany, the growth of maize smut (*Ustilago zeae*) on a synthetic dextrose-containing medium was markedly stimulated by the addition of an extract of the coleoptiles of young plants at the rate of 1 c.c. per 20 c.c. A similar but weaker effect was produced by an extract of young maize leaves, and also by low concentrations of heteroauxin (β-indoleacetic acid) and vitamin C (l-ascorbic acid), the former acting most vigorously at 0·0001 and the latter at 0·1 per cent.

Hunt (W. H.) & Thompson (M. R.). **A pharmacological study of Ustilago.**—*J. Amer. pharm. Ass.*, xxvii, 9, pp. 740–752, 6 graphs, 1938.

A tabulated account is given of the authors' studies, by a variety of pharmacological procedures, on the action of extracts of maize smut (*Ustilago maydis*) [*U. zeae*] on laboratory animals. The drug induced toxic effects of a varying nature [cf. *R.A.M.*, xvii, p. 174] on the different animals used in the tests, except in feeding experiments on white rats. The nature of the active substance of the smut has not been definitely determined: it is in any case not related to acetylcholine or histamine, while alkaloids are also apparently absent.

Vaheeduddin (S.). **The production of a new physiologic race of Sphacelotheca sorghi.**—*Phytopathology*, xxviii, 9, pp. 656–659, 1 diag., 1938.

A new physiologic race of *Sphacelotheca sorghi* [*R.A.M.*, xvii, p. 453] has been developed in the following way. In 1929 L. J. Tyler obtained a collection of the smut from Texas and isolated individual sporidia from the promycelia of several chlamydospores. The resultant monosporidial lines were inoculated into sorghum in various sexually compatible combinations with positive results. The writer carried out further experiments with the Texas material, crossing two monosporidial lines derived from separate chlamydospores. This process was effected by growing the lines separately in potato dextrose broth and injecting a mixture of the two cultures into Minnesota Amber sorghum plants. The resultant chlamydospores were designated cross 122, and by crossing this with a monosporidial line from a third chlamydospore, cross 123 was obtained, which on selfing yielded

cross 124. This differed in pathogenicity from any race hitherto described, as shown by experiments at St. Paul. Minnesota, in 1935, supplemented by others in 1936 in which the five races of *S. sorghi* previously recognized [ibid., xi, p. 448] were included.

The experimental data showed that the new cross (designated race 6) differs from races 5 and 4 in its lack of pathogenicity to Kafir×feterita (H.C. 2423) and White Yolo (K.B. 2525), respectively, from 3 in its failure to attack Pierce Kaferita (K.B. 2547), feterita (S.P.I. 51989) and Kafir×feterita, from 2 in sparing the Dwarf Yellow milos and White Yolo, and from 1 in causing slight infection of Hegari. It may further be distinguished from races 1, 2, and 3 in its action on the Schrock and Reed Kafir varieties, on which it produced 62 and 85·5 per cent. smut, respectively, as compared with 23·1, 16·5, and 23 per cent., respectively, for the other three races on the former and 0, 9·2, and 43·5 per cent., respectively, on the latter. Another feature of cross 124 is its grey to brownish peridium, in which it resembles races 2, 3, and 5 but differs from 1 and 4, with their brown peridia.

Ebeling (W.), Klotz (L. J.), & Parker (E. R.). **Experiments on Navel water spot.**—*Calif. Citrogr.*, xxiii, 10, pp. 410, 434–436, 3 figs., 1938.

Experiments conducted in 1937–8 in two groves at Claremont with the aim of determining the effect of oil sprays on the incidence of water spot of Navel oranges [*R.A.M.*, xvii, p. 811] showed that plots sprayed with the usual light medium oil had 17·3 and 32·1 per cent. water spot for the two groves, respectively, while the plots sprayed with a light toxic oil had 11·3 and 21·8 per cent. water spot, respectively, and those treated with miscible oil (used with lime-sulphur or ammonium polysulphide), with non-oil sprays, or fumigated, had 5 and 10·8 per cent. water spot, respectively, or less. The percentage of fruit affected with water spot initiated by wounds was larger in the oil-sprayed plots. The percentage of fruit free from water spot in the first grove was 73·6 to 76·4 in the plots sprayed with oil, 82·5 in plots sprayed with oil and wax emulsion, 81·2 in plots sprayed with light toxic oil, and 85·7 to 89·9 in the fumigated, non-oil-sprayed, and untreated plots, while the corresponding figures for the second grove, which had suffered more severe damage from water spot, were 53·4 to 59·3 for oil-sprayed plots, 63·4 for plots sprayed with oil and wax emulsion, 72·4 for plots sprayed with light toxic oil, and 81·5 to 86·7 for the fumigated, non-oil-sprayed and untreated plots. These results substantiate field observations on the role of oil sprays as a factor favouring the development of water spot.

Mandelson (L. F.) & Blackford (F. W.). **Brown spot of the Emperor of Canton Mandarin and its control.**—*Qd agric. J.*, 1, 2, pp. 132–143, 2 figs., 1938.

Brown spot of Emperor mandarins [*R.A.M.*, xvii, p. 376], a serious disease in Australia, appears to be restricted to New South Wales, where it has been known for many years, and Queensland, where it was first observed in 1928.

The first symptom is a black dot on the surface of the fruit shortly

after setting. This becomes a sunken, chocolate-coloured, circular spot ⅛ to ⅜ in. in diameter, with a raised area in the centre. Infection may occur at any point, frequently at the insertion of the stalk. Affected fruits tend to fall, especially when half-grown. Two forms of infection occur on the twigs. In one, the terminal shoots are brown and curled over, as if scorched by fire, the transition from diseased to healthy tissue being very abrupt. In the other, dark, sunken spots similar to those on the fruits, develop, and may emit large masses of gum; they tend to enlarge and form cankers. Dark brown spots, often surrounded by a light green to creamy halo, occur on the leaves, often at the margin, causing puckering and distortion. Affected leaves also tend to drop. Diseased trees produce new growth almost continuously throughout the season; this rapidly becomes affected, resulting in the presence of a large amount of dead wood.

Isolations by the junior author from fruit and leaf spots frequently yielded a species of *Gloeosporium*, inoculations with some strains of which on the uninjured rind of picked fruits gave typical lesions. Occasionally, young leaves on budded nursery trees sprayed with a spore suspension of the fungus developed typical spots accompanied by distortion.

Spraying tests [the results of which are tabulated] carried out from 1931 to 1938, inclusive, showed that effective control was given by three applications of home-made colloidal copper [loc. cit.].

Brown (J. G.) & Butler (K. D.). **Inflorescence blight of the Date Palm.**—*J. agric. Res.*, lvii, 4, pp. 313–318, 2 pl., 1 fig., 1938.

An inflorescence blight was found to attack a comparatively wide range of varieties of date palms from 11 to 31 years old in southern Arizona in 1935. The primary infection, which may occur anywhere on the rachis, results in water-soaking, discoloration, and shrinking of the infected tissues; the flowers are killed either through direct attack or by infection of the branches below them; diseased stalks often break under the increasing weight of the fruit. Blocks of tissues from infected parts yielded a pathogenic species of *Helminthosporium*, which is not considered in the present paper, and two species of *Fusarium*, one of which was identified by Sherbakoff and by the Centraalbureau voor Schimmelcultures as *F. moniliforme* (*Gibberella moniliformis* [*G. fujikuroi*]), and the other as *F. semitectum* by the former authority and as *F. lateritium* var. *fructigenum* [*F. lateritium*] by the latter. The perithecial stage of *G. fujikuroi* was produced in culture. Numerous inoculations with the two species of *Fusarium* gave mostly positive results; green date fruits were vigorously attacked by both species after being sprayed with spore suspensions of these fungi. Observations indicate that the weather in the Salt River Valley during the flowering season is usually favourable for the development of the disease. The pathological histology is briefly described. Removal of all staminate flower clusters after pollination is effected and of all pistillate raches after the fruit is harvested is tentatively recommended for control together with spraying of the palms before the spathes open, though experiments have not been specifically carried out.

WALLACE (G. B.). **Report on plant pathology.**—*Rep. Coffee Res. & Exp. Sta., Lyamungu, Moshi, 1937* (*Pamphl. Dep. Agric. Tanganyika* 22), pp. 50–51, 1938.

In continued tests of fungicides for the control of *Hemileia* [*vastatrix*] on Arabica coffee [*R.A.M.*, xvii, p. 315] in Tanganyika, Bordeaux mixture (1·0 and 0·5 per cent.) gave better results than a proprietary soluble copper hydroxide fungicide, and all three were better than the untreated controls. The *Hemileia* disease, first observed near Tukuyu in 1936, continued to spread in the Southern Highlands province. Damping-off of coffee cuttings and seedlings in frames and boxes, associated with a species of *Rhizoctonia* [loc. cit.], has been kept within reasonable bounds chiefly by preventive measures. The parasite does not invariably cause the death of the young plants and the great majority can be preserved by improving the cultural conditions. No further damage arises after the young plants are transferred from the frames to the field.

GHESQUIÈRE [J.]. **Rapport annuel pour l'exercice 1937. Division de Phytopathologie et d'Entomologie.** [Annual report for the financial year 1937. Division of Phytopathology and Entomology.]—*Publ. Inst. nat. Étud. agron. Congo Belge* (hors sér.), pp. 19–26, 2 figs., 1938.

During 1937 coffee at Bukavu, Belgian Congo, showed nodular fasciation apparently due to a bacterium close to *Bact. tumefaciens*. Fungi attacking coffee at Kivu and Ituri included *Hemileia vastatrix*, *Cercospora coffeicola*, *Glomerella cingulata*, *Fusarium* aff. *coffeicola*, *Rigidoporus microporus* [*Fomes lignosus*], and *Corticium salmonicolor*. *Cercospora coffeicola* was prevalent chiefly in excessively damp or shady plantations. Infection by *G. cingulata* was very intense in the south of Kivu, on trees surrounded at the collar with undecomposed compost and manure. Coffee treated experimentally in this way became infected by either *C. coffeicola* or *G. cingulata* if these happened to be prevalent in the vicinity.

s'JACOB (J. C.). **Voedingsphysiologische onderzoekingen bij Coffea arabica L.** [Nutritional-physiological studies on *Coffea arabica* L.] —*Arch. Koffiecult. Ned.-Ind.*, xii, 1, pp. 1–48, 23 figs., 1938. [English summary.]

In water-culture experiments at the Besoeki Experiment Station, Java, to determine the nutritional requirements of coffee, Shive's synthetic solution (*Physiol. Res.*, i, 1914) was the only one of several tested containing the necessary elements for the growth of the plants.

In the course of preliminary tests boron deficiency was found to induce malformation of the young leaves, and blackening and dying-off of the terminal bud in coffee and *Salvia officinalis*. Lack of nitrogen results in the development of stunted coffee plants with yellowish-green leaves. Calcium deficiency causes severe root damage and the development of slipper-shaped leaves, followed by premature death of the plants. Calcium excess is not harmful in the form of calcium chloride, but as calcium carbonate it induces foliar chlorosis and causes a decline

in the acidity of the medium with resultant diminution of iron availability. Since only minute quantities of potassium are requisite for the normal growth of coffee, the lack of this element is not generally strikingly apparent but may be manifested by the formation of small, dry, grey spots on the leaf margins. Excess of potassium causes a light yellow mottling and premature dying-off of the foliage and shortening and thickening of the roots. Neither deficiency nor excess of phosphorus produced any adverse effects. A typical spotting of a restricted zone of the leaves was observed in plants deprived of magnesium, while an excess of this element caused general debility and slight chlorosis. Yellowish, convex leaves and small, thin roots are characteristic of plants suffering from sulphur deficiency. Excess of sulphur induced symptoms resembling those due to too high a total concentration of the culture solution. A reddish-brown foliar discoloration and marginal dryness are typical of plants receiving a superabundance of sodium chloride, the leaves being convex and hanging down the stem. Iron deficiency induces a yellowing of the leaves and pale green veins.

In a series of tests to determine the influence of ammonium salts as a source of nitrogen on the growth of coffee, serious damage occurred at a lower P_H than 4·5 to 5, the lower leaves developing greyish-brown margins while the upper ones become convex and yellow.

Plants grown in highly concentrated (5×) solutions contracted symptoms closely resembling those of 'pseudonodule formation' as described by De Fluiter (*Bergcultures*, x, p. 1612, 1936).

CASTELLANI (E.). **La ruggine del Caffè nel Harar.** [Coffee rust in Harar.] —Reprinted from *Agricoltura colon.*, xxxii, 8, 11 pp., 3 figs., 1 map, 1938.

During a journey in Italian East Africa along the valley of the Auasc to Arba, and thence to Harar and Errer the author observed that the most prevalent diseases of coffee (*Coffea arabica*, Moka Harrar type) were *Hemileia vastatrix* [cf. *R.A.M.*, xvi, p. 379], first observed at Gololcià in 1930, and *Cercospora coffeicola*. Rust-resistant types were observed, of which that referred to as 'Street' has dense, dark, large leaves, while the 'Timpon' type has marked resistance to rust, but is more susceptible to drought and shows less regularity in production. Proceeding northwards from Gololcià the author observed *H. vastatrix* in practically every locality where coffee was grown. At the higher altitudes, no serious damage was caused, but lower down, and especially along the rivers, infection was more severe. In the vicinity of Harar (altitude, 1,800 to 1,950 m.) the disease was not causing serious damage. The worst attacks were found at Errer (1,020 m.) where infection was extremely severe, being favoured by unsuitable climatic conditions and cultural practices. It is concluded that, taking the country as a whole, *H. vastatrix* need not be regarded as constituting a limiting factor in coffee production. The disease can be controlled by adopting suitable measures. Plantations of *C. arabica* should be situated at altitudes between 1,400 and 2,000 m., and should be brought under the best possible cultural conditions. In new plantations, resistant types should be planted.

ANDREWS (F. W.). **Investigations on black-arm disease of Cotton under field conditions. III. The mode of infection of the newly planted crop.**—*Emp. J. exp. Agric.*, vi, 23, pp. 207–218, 1 graph, 2 maps, 1938.

Further investigations carried out in the Anglo-Egyptian Sudan into cotton blackarm [*Bacterium malvacearum*] [already noticed in part from another source: *R.A.M.*, xvii, p. 521] showed that at most only a quarter of the soiled seed left on the ground at the end of the picking season germinates during the rains, equivalent to a possible 5 lb. viable seed-cotton per acre. Possibly only a very small proportion of these seeds give rise to inherently infected seedlings, and a greater proportion are probably infected by rain-splash from infected debris in the vicinity. The potentialities of this infected material are thought to be considerable. The introduction of the disease into areas not previously sown to cotton was found to be due to the presence of seed cotton introduced by the native workers, cotton seeds and seedlings from this material, and old stalks, which had been used as fuel.

The observations clearly demonstrated the impossibility of raising clean cotton plants in the Gezira area, even in localities where cotton has not before been grown. The sowing-seed in the areas observed was free from disease; the bacteria in infected leaves cannot survive the weathering of the pre-sowing period, and as wind-blown debris consists almost wholly of leaves, it is apparent that infection must have been due to the introduction of infective material by human beings. Legislative measures to prevent this would, under the local conditions, be unavailing. Until a blackarm-resistant strain has been developed, the most that can be done is to adopt such practical remedial measures as will keep the disease within reasonable bounds.

NEAL (D. C.) & LOVETT (H. C.). **Further studies of crinkle leaf, a disorder of Cotton plants prevalent in Lintonia and Olivier silt loam soils of Louisiana.**—*Phytopathology*, xxviii, 8, pp. 582–587, 2 figs., 1938.

Further studies on crinkle leaf of cotton in Louisiana [*R.A.M.*, xvii, p. 317] showed that the disease is associated with high soil acidity, calcium deficiency, and manganese toxicity. It is readily corrected by calcium and other basic carbonates, but evidence was obtained that it is not due to calcium deficiency *per se*. When calcium was supplied in pot and field tests in the form of calcium sulphate in amounts adequate for nutritional requirements it failed to control the disease, probably because the P_H value of the treated soil remained unchanged (4·8 to 5), and so permitted manganese to remain in solution and exercise a toxic effect. At the higher P_H value produced by treating the soil with the basic carbonates (calcium, magnesium, and potassium carbonates), the manganese appeared to be precipitated, and the plants remained healthy. The fact that the soil in the affected localities has a consistently lower P_H value and contains significantly more manganese than the soil in healthy areas indicates that the condition is attributable to manganese toxicity. This view was confirmed when typical symptoms were produced in cotton plants in sand cultures by adding increasing amounts of manganese sulphate.

GREATHOUSE (G. A.). **Suggested role of alkaloids in plants resistant to Phymatotrichum omnivorum.**—*Phytopathology*, xxviii, 8, pp. 592–593, 1938.

Preliminary studies having indicated the presence of alkaloids in crude extracts from the roots of plants resistant to *Phymatotrichum omnivorum* [*R.A.M.*, xvii, p. 673] a number of these substances were isolated and shown to inhibit the growth of the fungus even in concentrations lower than that found in the plant tissue. A study of the literature of alkaloids showed that of 125 species of plants in which alkaloids have been reported 0, 2, 40, 44, and 39 were extremely susceptible, highly susceptible, moderately susceptible, resistant, and immune, respectively, representing 0, 0·55, 4·56, 10·92, and 9·56 per cent., respectively, of the total ratings from 2,116 plants placed in these groups.

NEAL (D. C.) & HADDON (C. B.). **A promising wilt-resistant long staple Cotton.**—*J. Amer. Soc. Agron.*, xxx, 8, pp. 644–646, 2 figs., 1938.

Details are given of a new selection of Delfos cotton, 2323–965–425, made by the junior author at the Northeast Louisiana Experiment Station in 1934, which has showed outstanding resistance to wilt (*Fusarium*) [*vasinfectum*: *R.A.M.*, xvii, p. 525 and next abstracts] in three years' tests at Baton Rouge. In 1937 it showed only 0·5 per cent. infection among a total population of over 600 plants, compared with 63 per cent. in a Half and Half stand comprising 516.

YOUNG (V. H.). **Control of Cotton wilt and 'rust', or potash hunger, by the use of potash-containing fertilizers.**—*Bull. Ark. agric. Exp. Sta.* 358, 26 pp., 1 map, 1938.

In plot experiments on the control of cotton wilt (*Fusarium vasinfectum*) [see next abstracts], carried out over a period of nine years (1929 to 1937) in 15 different sites in Arkansas, on the susceptible cotton varieties Trice 304, Missdel 2, 3, and 4, Arkansas Acala 37, and the moderately resistant Arkansas Rowdens 40, 2119, and 2088, fertilizers containing potash reduced the incidence of wilt and gave complete control of the 'rust' or potash deficiency disease of cotton [*R.A.M.*, xvii, p. 110] in all but two cases, one of which was a site severely infested with root knot nematodes (*Heterodera marioni*). Full data on the results obtained with potash alone or in various combinations with nitrate of soda and superphosphate are given. Applications of potash alone, either as kainit (which was the most efficient of all the fertilizers tested) or muriate of potash often gave better control of wilt on both the susceptible and the resistant varieties of cotton than mixed fertilizers containing the same amount of potash, yet the latter gave better yields. Applications of higher amounts of potash were more effective than low amounts but excessively high amounts did not give correspondingly better results. The effectiveness of potash fertilizers varied greatly at different sites under different environmental conditions. The lowest incidence of wilt occurred when a moderately resistant variety was treated with potash-containing fertilizers, except when nematodes were present. Nitrate alone had no effect, but acid phosphate and nitrate and acid phosphate alone seemed to increase both wilt and

'rust'. Cottonseed meal did not control either of these diseases, but stable manure, used at the rate of 10 tons per acre, gave marked control of 'rust' and a slight decrease of wilt. There was some evidence that potash applications were cumulative in their effect on the control of both wilt and 'rust', whereas fertilizers lacking potash resulted in increasingly greater damage from both diseases.

MILLER (P. R.) **A survey of Cotton seedling diseases and the fungi associated with them.**—*Plant Dis. Reptr*, xxii, 13, pp. 260–263, 3 maps, 1938. [Mimeographed.]

Out of 344 plantings made from cotton seedlings affected with damping-off and collected at random in Virginia, North Carolina, South Carolina, Georgia, Alabama, Mississippi, Louisiana, Texas, and Tennessee, *Glomerella gossypii* [*R.A.M.*, xvi, p. 314] was isolated 283 times, *Fusarium moniliforme* [*Gibberella fujikuroi*] 239, and *Rhizoctonia* [*Corticium*] *solani* 44. *G. gossypii* was predominant in samples from every State except Texas. Other fungi found comprised *F.* spp., *Pythium* spp. (a species of *P.* being predominant on a few samples from limited localities in South Carolina and Tennessee collected during cold, wet weather), *Diplodia gossypii*, *R. bataticola* [*?Macrophomina phaseoli*], *F. vasinfectum* [see preceding and next abstracts], and *Sclerotium rolfsii*. *C. solani* appeared to be more important as a seedling pathogen in Mississippi and Louisiana than in the other States. Comparative counts of seedlings from treated and untreated seed showed that three times as many plants survived when the seed had been treated as when it was untreated. The lesions found on seedlings from treated seed were generally small and superficial.

LLOSA (T.). **Investigaciones referentes al 'wilt' del Algodonero y nuevo método para aislar hongos del tipo Verticillium o Fusarium de plantas atacadas por el 'wilt' del Algodonero.** [Investigations on Cotton 'wilt' and a new method of isolating fungi of the *Verticillium* or *Fusarium* types from plants infected by Cotton 'wilt'.]—*Bol. Estac. exp. agric., Lima*, 13, 22 pp., 3 figs., 1938. [English summary.]

A species of *Verticillium* [see next abstract] has been isolated from the vascular tissues of wilted cotton plants in Peru and is thought to be probably the primary agent of the disease, *Fusarium* [*vasinfectum*: *R.A.M.*, xiii, p. 231 and preceding abstracts] being of secondary importance, though its rapid growth on the standard potato broth dextrose agar medium is liable to obscure and suppress the development of the *Verticillium* in cultures from infected roots. A strongly acid concentration of the medium (P_H 3·1) is unfavourable to the growth of the *Verticillium* but promotes that of *F. vasinfectum*. The filtrates of two strains of each of the fungi under investigation were toxic to the cotton plants tested.

Detailed directions are given for the isolation of the cotton wilt fungi from the petioles instead of the roots, adventitious fungal contaminants being thereby eliminated and the risk of erroneous interpretations obviated.

SAREJANNI (J. A.). **La verticilliose du Coton en Grèce.** [Cotton verticilliosis in Greece.]—*Ann. Inst. phytopath. Benaki, Greece,* ii, 2, pp. 79–85, 1936 [issued 1938].

Cotton wilt (*Verticillium albo-atrum*) [*R.A.M.*, xvii, pp. 504, 814, and preceding abstract], first observed in Greece in 1932 [ibid., xiii, p. 632], is stated to be now widespread in the country, doubtless on account of the extended cultivation of the susceptible American varieties, Acala, King, Trice, and Ingold, in place of the apparently immune native Dadiotico (*Gossypium herbaceum*). The symptoms of the disease are described and the taxonomy of the causal organism briefly discussed. In Greece outbreaks of wilt are liable to occur towards the end of June or early in July and again about the end of September, the former being much more severe than the latter and occasionally causing up to 70 per cent. infection in the plantations of Livadia, though as a rule the incidence is under 10 per cent. In the laboratory, cultures of *V. albo-atrum* remained viable for three years without subculturing and withstood temperatures exceeding 40° and below 0° C. The extraordinary rapidity with which the disease has spread in Greece is considered to point either to the seed or to the aerial transport of conidia as the main source of infection, dissemination through the soil, if it occurs at all, being of little importance.

CARTWRIGHT (K. ST G.). **A further note on fungus association in the Siricidae.**—*Ann. appl. Biol.*, xxv, 2, pp. 430–432, 1938.

A fungus isolated from the glands, eggs, and oviposition and larval tunnels of *Sirex gigas* has been identified as *Stereum sanguinolentum* [*R.A.M.*, xiii, p. 341; xvii, p. 715], while a very similar fungus isolated from *Sirex cyaneus* is believed to be a form of the same species. There is very strong evidence indicating that in England only one species of fungus is associated with each of these insects. Under moisture conditions in the wood favourable to the larvae only slow development of the fungus can take place generally, but at a higher humidity rapid growth of the fungus occurs, with apparently fatal results to the larva of *S. gigas* in one instance. The fungus was found to be present in glands at the base of the ovipositor in late-stage female pupae and is introduced into the wood during oviposition.

Isolations from larval tunnels and from glands of an adult female *Xiphydria prolongata* yielded a culture resembling *Daldinia concentrica.*

PUNTONI (V.). **Studi sul genere Trichosporon.** [Studies on the genus *Trichosporon.*]—*Mycopathologia*, i, 3, pp. 169–181, 4 pl., 1938. [English summary.]

This is an expanded version of the author's recent paper [*R.A.M.*, xvii, p. 599], in which he redefined the genus *Trichosporon* and gave descriptions of six species. In addition he now suggests the segregation of a third suborder of the Thallosporales, Blasto-arthrosporineae, to include the Trichosporaceae, with the genus *Trichosporon.*

REDAELLI (P.), CASTELLI (T.), & CIFERRI (R.). **Presence of Mycotorula albicans and Blastodendrion krausi in Italian home-made bread yeast.**—*Mycopathologia*, i, 3, pp. 182–184, 1938.

A brief account is given of two asporogenous yeasts, namely, *Myco-*

torula [*Candida*] *albicans* [*R.A.M.*, xvii, p. 817] and *Blastodendrion krausi*, which in 1936 were isolated by one of the authors from samples of home-made baker's yeast in Italy. This is believed to be the first record of the occurrence of these organisms in yeast.

Boedijn (K. B.) & Verbunt (J. A.). **Annotations about dermatomycoses in Batavia.**—*Mycopathologia*, i, 3, pp. 185–198, 6 pl., 4 figs., 1938.

Following a discussion on the incidence of dermatomycoses in Batavia, a list is given, with full annotations, including clinical observations, of eight pathogenic fungi isolated by the authors from patients in 1935–6, namely: *Epidermophyton rubidum* [*Trichophyton rubrum*], *E.* [*T.*] *interdigitale*, *T. plicatile* [*R.A.M.*, xvi, p. 458], *Favotrichophyton* [*T.*] *ochraceum* [ibid., xvii, p. 395], *F. decipiens* n.sp., *Mycotoruloides unguis*, *Proteomyces variabilis* n.sp., and *Piedraia javanica* n.sp. Latin diagnoses of the new species are appended.

F. decipiens forms effuse, cerebriform cultures, with elevated centre and radiating margins, slightly pubescent, and of a dirty brownish-purple colour. The mycelium is septate, branched, and undulate; the chlamydospores are numerous, terminal, lateral, or sometimes intercalary, globose at first but oval to elliptic when ripe, thick-walled, and 17·5 to 32 by 12 to 20 μ in diameter. In old cultures the cells of some hyphae swell to form arthrospores, either globose, 5 to 11 μ in diameter, or elongated, 11 to 15 by 7 to 10 μ.

Proteomyces variabilis is characterized by vermiculate, dirty ochraceous cultures, with branched, septate mycelium varying considerably in diameter and breaking up into blastospores; the latter are 4 to 17 μ long, and produce numerous buds. Giant cells, 20 to 34 μ in diameter, are also present.

Piedraia javanica forms hard, black nodules on the hairs, which by confluence may attain a length of 750 μ and a thickness of 130 to 187 μ. The tissue is pseudoparenchymatous, consisting of dirty brown cells arranged in regular vertical rows. In the ripe stroma, globose to slightly elongated locules are formed, 50 to 100 μ in diameter, each containing a few asci. The asci are 8-spored, broadly elliptical, shortly stalked, and thin-walled, and the ascus wall soon disappears by deliquescence. The spores are hyaline and very variable in shape and size from long-cylindrical to more or less curved, and from 20 to 60 by 4 to 12 μ in diameter; each spore is surrounded by a thin membrane prolonged at the ends into straight or curved appendages, 2 to 28 by 1·5 to 3·5 μ.

Catanei (A.). **Sur la place des Trichophyton violaceum et glabrum dans la classification.** [The position of *Trichophyton violaceum* and *T. glabrum* in classification.]—*Mycopathologia*, i, 3, pp. 199–200, 1938.

The author states that 17 out of the 41 strains of *Trichophyton violaceum*, and 12 out of the 24 strains of *T. glabrum* [*R.A.M.*, xvii, p. 818] studied by him in culture on rice-flour agar, produced conidia of the *Acladium* type, thereby confirming the correctness of the assignment of these organisms to the endothrix section of the genus *Trichophyton*. Evidence is further adduced showing that these two species are distinct from one another.

Ciferri (R.), Verona (O.), & Saggese (V.). **Reisolamento della Pseudomycoderma matalense e revisione del gruppo.** [A new isolation of *Pseudomycoderma matalense*, and a revision of the group.]—*Mycopathologia*, i, 3, pp. 212–223, 1 pl., 1938.

The authors state that the results of comparative morphological, cultural, biochemical, and pathogenicity studies [details of which are given] showed that a fungus, isolated by one of them in Italy from the faeces of a child suffering from chronic enterocolitis, is identical with the original strain of *Geotrichum* (*Oidium*) *matalense* preserved at the Centraalbureau voor Schimelcultures in Baarn, and also with *G. matalense* var. *chapmani* [*R.A.M.*, xii, p. 117]. The work is further claimed to have justified the reference of *G. matalense* by Ciferri and Redaelli to the genus *Pseudomycoderma* (*Arch. Mikrobiol.*, vi, 1, pp. 9–72, 1935), but a review of the systematic position of this genus leads them to reduce it to the rank of a subgenus of *Geotrichum*. The latter genus is the only one possessing an arthrosporous form of multiplication, never forming blastospores, and its subdivision is now suggested, on the basis of the relative amounts of arthrospores formed in relation to the mycelial hyphae, into the following three subgenera: (1) *Berkhoutia*, forming powdery colonies, with mycelium poorly developed, and completely absent at maturity, all the hyphae being transformed into arthrospores by schizogenesis; (2) *Eugeotrichum*, with well-developed mycelium even at maturity, and in part persistent; the mycelial hyphae are only in part reduced to arthrospores and the colonies are typical of *Geotrichum*; (3) *Pseudomycoderma*, with mycelium very abundant at any stage of growth, and dominant over thallospores; arthrospores are rare or very rare, and there is a strong tendency to reduce the colonies to a purely mycelial type.

The Italian strain of *G. matalense* was shown experimentally to be slightly more pathogenic to rabbits than the other two strains studied, but the part played by it in the child's disease still remains to be determined.

Lacaz (C. da S.). **Chromomycoses.**—*Brazil-med.*, lii, 24, pp. 555–560; 25, pp. 578–583, 6 figs., 1938. [Abs. in *Trop. Dis. Bull.*, xxxv, 11, p. 832, 1938.]

This is a general account of chromoblastomycosis in Brazil, beginning with the earliest records of the disease, attributed to *Hormodendrum* [*R.A.M.*, xvii, p. 819] by A. Pedroso and J. M. Gomes in 1911, the species *H. pedrosoi* [ibid., xvii, p. 747] having been named by Brumpt in 1922. Fungi subsequently implicated in the etiology of the disorder include *Phialophora verrucosa* [ibid., xvii, p. 821] and *Acrotheca* [ibid., xvi, p. 99]. Particulars are given of the local distribution of the 48 cases so far observed in the country.

Moore (M.). **Blastomycosis, coccidioidal granuloma and paracoccidioidal granuloma: comparative study of North American, South American and European organisms and clinical types.**—*Arch. Derm. Syph., Chicago*, xxxviii, 2, pp. 163–190, 11 figs., 1938.

This is a descriptive account and critical discussion of the clinical

aspects, appearance in the host tissues or pus, cultural features (macro- and microscopic), and biological characters of the fungi associated with blastomycosis and coccidioidal granuloma in Europe and North and South America. The following classification is used: coccidioidal granuloma (Posada's disease, 1892, Rixford and Gilchrist, 1894) due to *Coccidioides immitis* [*R.A.M.*, xvii, p. 528]; North American blastomycosis or Gilchrist's disease, 1894, caused by *Zymonema* (*Endomyces*) *dermatitidis*, *Z. capsulatum* (*E. capsulatus*) and its var. *isabellinus* [ibid., xvii, p. 394]; European blastomycosis (Busse-Buschke's disease, 1894) caused by *Cryptococcus hominis*, *Atelosaccharomyces hominis*, or *Torulopsis* [*Debaryomyces*] *neoformans* [ibid., xvii, p. 677]; and South American blastomycosis (also known as paracoccidioidal granuloma or Lutz-Splendore-de Almeida disease, 1908) due to *Paracoccidioides brasiliensis* [ibid., xvii, p. 598], *P. tenuis* Moore n.sp., or *P. cerebriformis* Moore (in *Rev. Biol. Hyg., S. Paulo*, vi, p. 148, 1935).

P. tenuis [Latin and English diagnoses of which are given] is characterized by a general resemblance to *P. brasiliensis* both in the host tissues and in culture except for the proportionately smaller dimensions of its hyphae (1 to 3·5 μ in diameter), spherical, sclerotic, and intercalary cells (5 to 20, 5 by 7 to 15 by 20, and up to 10 μ in diameter, respectively), chlamydospores (usually 5, occasionally up to 10 μ in length, 4 to 10 μ in diameter), hyphal swellings (4 μ), terminal hypnospores (7 to 12, rarely 7 by 25 μ), and lateral, sessile, or pedicellate conidia (5 μ). Racquet mycelium is present. The fungus generally makes good though slow growth on artificial media, except Czapek's agar; the colonies are white at first, turning light tan, compact, verrucoid, vermiculate, and somewhat cerebriform, with a raised to umbilical centre, showing folds or radiating ridges. *P. tenuis* does not ferment carbohydrates, liquefy gelatine, or coagulate litmus milk.

KAYE (H.). **A case of rhinosporidiosis of the eye.**—*Brit. J. Ophthal.*, xxii, 8, pp. 449–455, 5 figs., 1938.

Full clinical details are given of a case of rhinosporidiosis of the eye [*Rhinosporidium* (?) *seeberi*: *R.A.M.*, xvi, p. 534] in a 16-year-old European boy at Johannesburg, South Africa, in which country the disease is stated to be exceedingly rare in man, this being only the fifth record of its occurrence.

TRUNINGER (E.). **Über die Verwendung von Bor als Vorbeugemittel gegen das Auftreten von sogenannten Kalkschädigungen bei Pflanzen.** [On the use of boron as a prophylactic against the development of so-called lime injuries in plants.]—*Schweiz. landw. Mh., 1938*, 6–7, pp. 196–211, 5 figs., 1 graph, 1938.

A fully tabulated account is given of the writer's successful pot experiments at the Federal Agricultural-Chemical Institute, Liebefeld, Berne, on the prevention, by the admixture with the soil of boric acid at rates corresponding to 10 kg. per hect., of lime-induced chlorosis of flax and various abnormalities in mustard, cress, red and white radishes, carrots, and spinach due to the unbalanced absorption of lime, either when used as a fertilizer or occurring in tap water.

Calinisan (M. R.). **Vascular disease of Abacá (Manila Hemp) in Davao: progress report No. 1.**—*Philipp. J. Agric.*, ix, 2, pp. 153–157, 159–160, 11 pl., 1938.

From abacá (*Musa textilis*) plants suffering from a vascular disease characterized by symptoms resembling those of Panama disease due to *Fusarium oxysporum* f. 3 [*F. oxysporum* var. *cubense*: *R.A.M.*, xvii, p. 40] in various parts of the Philippines, the writer has isolated in pure culture bacteria (present in the xylem vessels, parenchymatous cells, and phloem) and the above-mentioned fungus, which was commonly localized in the pseudo-stem. A weevil, *Odoiporus paganus*, has also been found associated with the disease, and inoculation experiments with all three organisms are in progress. Of 306 plants examined, 109 (35·62 per cent.) showed joint disease and insect infestation, 173 (56·63 per cent.) vascular disease alone, and 24 (7·84 per cent.) the weevil alone. The disease was first observed in 1931–2 in the Upper Bayabas, Guianga District, at an altitude of 3,000 to 3,600 ft. above sea-level, whence it rapidly spread to lower elevations; up to 31st July, 1937, the total infected area was estimated at 309·43 hect. and the aggregate value of the damage at 200,000 to 300,000 pesos [1 peso = 2*s.* 0·6*d.* at par]. A subsidy of 6,000 pesos towards the work of eradication has been granted by the responsible authorities.

Beaumont (A.) & Buddin (W.). **Notes on Fusarium avenaceum attacking the leaves of Tulips in glasshouses.**—*Trans. Brit. mycol. Soc.*, xxii, 1–2, pp. 113–115, 1938.

Small lesions, up to 1 cm. across, observed on leaves of the tulip variety William Copland in a greenhouse near Exeter in 1931 and 1932, were associated with a fungus identified by Dr. H. W. Wollenweber as *Fusarium herbarum* var. *tubercularioides* [*R.A.M.*, xiv, p. 366], a species later included by the same authority in *F. avenaceum* [ibid., xiv, p. 709]. The same fungus was isolated by E. R. Wallace from tulip leaves in Lincolnshire in 1931 and it has also been seen in Berkshire, Hampshire, Middlesex, and Oxfordshire. Field observations, confirmed by inoculation experiments, showed that the disease was favoured by high temperatures (70° C. or over) and high humidity (80 to 100 per cent.), and is, therefore, unlikely to develop outside greenhouses, where it is, with rare exceptions, of only minor importance. Under favourable conditions spore masses are found on the spots on the leaves; in the absence of spores the spots can be easily mistaken for those caused by 'fire' [*Botrytis tulipae*], but they do not develop on the flowers and are less numerous and conspicuous. The common habit of using straw, on which the fungus can persist and increase, to cover the boxes of bulbs during rooting, and particularly the use of the same straw during several seasons, is considered to favour the development of the disease. Cultures of the fungus from tulip proved highly pathogenic to wheat. The use of clean straw and correct regulation of temperature and humidity in the greenhouse are recommended for the control of the disease.

Guard (A. T.). **Studies on control of Tulip blight.**—Abs. in *Proc. Ind. Acad. Sci.*, xlvii, p. 73, 1938.

Tulip bulbs treated with 2 per cent. formaldehyde and planted in

clean soil were completely freed from the mycelium and sclerotia of *B[otrytis] tulipae* [*R.A.M.*, xvii, pp. 96, 112], whereas naphthalene, though inhibiting the growth of the fungus, was not lethal. Neither preparation damaged the bulbs at the concentrations tested.

McCulloch (Lucia). **Leaf blight of Iris caused by Bacterium tardicrescens.**—*Phytopathology*, xxviii, 9, pp. 642–649, 2 figs., 1938.

Further particulars, including a technical description of the agent, are given of the leaf blight of iris caused by *Bacterium tardicrescens* [*R.A.M.*, xvi, pp. 463, 677], now known to occur on varieties mostly of the bearded group in Virginia, Maryland, District of Columbia, and other regions extending from Alabama to Massachusetts. In addition to the information already summarized, it is mentioned that inoculations by spraying outdoor iris plants with a suspension of the bacteria resulted in the formation after three weeks of small, yellow spots on the leaves but after a rainy period considerable infection developed. The chief factor in promoting good infection was a moist atmosphere for five or six days; wounding the leaves was not only unnecessary but often detrimental to infection. The minimum, optimum, and maximum temperatures for the growth of the organism are about 5°, 26° to 27°, and 32° C., with a thermal death point at 44° to 46°. *Bact. tardicrescens* survived exposure to a temperature of —17·8° to —20° for 17 months, at the end of which time it was strongly pathogenic in inoculation tests on bearded irises. Desiccation on cover glasses at 27° was resisted for five to six days, rarely longer, while five minutes or less in direct sunlight sufficed to destroy the organism. Control measures should therefore be largely based on exposure of the soil to sun and drying conditions. The optimum hydrogen-ion concentration for development on beef media was found to lie between P_H 6·5 and 7. Positive results were obtained in inoculation experiments with *Bact. tardicrescens* on *Iris cristata*, *I. sibirica*, *I. missouriensis*, *I. kaempferi*, *I. tenax*, *I. orientalis*, and the blackberry lily (*Belamcanda* sp.).

Green (D. E.) & Wilson (G. F.). **Pests and diseases of bearded Irises.**—*Gdnrs' Chron.*, civ, 5094, pp. 114–116, 3 figs. (2 on pp. 113, 117), 1938.

In descending order of importance, the chief diseases of bearded iris in England are rhizome rot (*Bacillus carotovorus*) [*Erwinia carotovora*: *R.A.M.*, xiv, p. 698; xvi, p. 182], leaf spot (*Heterosporium gracile*) [?*Didymellina macrospora*: ibid., xvii, p. 750], basal grey mould, due to a species of *Botrytis* [cf. ibid., xvi, p. 750], and scorch, the cause of which has not yet been ascertained [ibid., xiv, p. 698].

The control of rhizome rot consists in the prompt removal and burning of all infected material, dusting the cut surfaces and remaining rhizomes with copper-lime dust, and sprinkling the same dust on the adjacent soil; soil dressings of superphosphate of lime are very beneficial.

Spraying with a mixture containing copper helps to check leaf spot, but infection can generally be avoided by removing and burning all diseased and dying leaves in the autumn and again in spring.

Basal grey mould starts in late spring at the base of the fans as a yellow patch, and quickly develops into a grey mould. In a wet, cold spring even the most vigorous fans may be killed. Smooth, black

sclerotia overwinter in the soil, and reinfect the young fans in the following year. Affected fans should be immediately cut down near the ground and burnt.

Scorch may be recognized when the top three or four inches of nearly all the leaves droop and turn a reddish-chocolate colour. The condition generally develops during the first spell of hot, dry weather in early summer. Most of the roots are hollow, rotting away in winter or early spring, but the rhizome itself is normal. Affected plants should be lifted and the roots removed, the rhizomes washed or soaked in potassium permanganate, and the plants replanted either in a well-drained situation or on the old site, after this has been deeply dug and improved; as a further precaution, Cheshunt compound may be used for watering in.

GREGORY (P. H.). **Sclerotinia polyblastis n.sp. on Narcissus the perfect stage of Botrytis polyblastis Dowson.**—*Trans. Brit. mycol. Soc.*, xxii, 1–2, pp. 201–203, 1938.

English and Latin diagnoses are given of *Sclerotinia polyblastis* n,sp., designated as the perfect stage of *Botrytis polyblastis* Dowson [*R.A.M.*, xvii, p. 42], on the basis of the following observations. Nine single ascospore cultures were isolated from apothecia of a *Sclerotinia* collected in February 1938 in the Scilly Isles on the overwintered leaves of narcissus of the 'Soleil d'Or' variety, which had been killed by 'fire' (*B. polyblastis*) in the previous summer. These ascospore cultures on prune or oatmeal agar resembled those from single conidia of *B. polyblastis* in general appearance as well as in microscopic characters, particularly the production in sporodochia of great numbers of slimy phialospores (microconidia), which were apparently unable to germinate. Under conditions so far tested neither the ascospore cultures from the *Sclerotinia* nor the conidial cultures of *B. polyblastis* produced any conidia of *Botrytis*, but when healthy, uninjured narcissus flowers in moist dishes were inoculated from each of these single ascospore cultures, large conidia up to 60 μ in diameter developed profusely round the site of inoculation after eight days. Similar conidia developed following inoculations with multiascospore cultures. Finally, single conidia from these inoculated flowers again produced cultures typical of *B. polyblastis*.

The new species has burnt umber-brown, scantily pubescent apothecia; the disk is cyathiform, becoming discoid, 3 to 4 mm. in diameter; the stipe is 3 to 8 mm. long, and tapers to 0·5 mm. in diameter at the umber-brown to blackish base; the asci are cylindrical, 150 to 170 by 7 to 10 μ; the ascospores are uniseriate, ellipsoid, non-septate, hyaline, normally 14 to 20 by 7 to 10 μ, but often abortive and 10 to 14 by 6 to 10 μ, the paraphyses are straight, filiform, septate, with clubbed or somewhat irregular tips; the sclerotia are black, 3 to 8 mm. long, 1·5 to 3 mm. wide, 1 to 1·5 mm. thick, flattened, and embedded in the leaf tissue. The species has also been found at St. Hilary, Cornwall.

WERNHAM (C. C.). **Chlamydospore production on artificial media by Urocystis gladioli.**—*Phytopathology*, xxviii, 8, pp. 598–599, 1 fig., 1938.

Gladiolus bulbs received from Fairview, Pennsylvania showed the

presence of an organism tentatively identified as *Urocystis gladioli* [*R.A.M.*, xvi, p. 63], apparently the first report of gladiolus smut from America. Germination of the spore balls was obtained in 12 hours by streaking them on potato dextrose agar plates, and in all the cases observed was akin to that of *U. cepulae*. In pure culture the fungus produced a reddish-brown, prostrate mycelium of uniform appearance and large numbers of chlamydospores of the *U. gladioli* type, which germinated in the same manner as those from the corms.

PIRONE (P. P.). **Where are Gardenia cankers initiated?**—*Phytopathology*, xxviii, 8, pp. 597–598, 1 fig., 1938.

Further studies carried out in New Jersey on gardenia stem canker (*Phomopsis gardeniae*) [*R.A.M.*, xvii, p. 398] showed that in a large percentage of cases infection begins at the leaf joints on the base of the cuttings after they are set in the rooting medium. The freshly cut surfaces left when the growers have removed the lower leaves with a sharp knife before embedding the cuttings provide an excellent site of entrance for the fungus and are important foci for later infection.

WHITE (R. P.). **Rhododendron wilt and root rot.**—*Bull. N.J. agric. Exp. Stas* 615, 32 pp., 14 figs., 4 graphs, 1937. [Received November, 1938.]

Continuing his studies on the wilt and root rot of *Rhododendron ponticum* and other *R.* spp. in New Jersey [*R.A.M.*, xv, p. 808], the writer, after recapitulating information already presented, reports the existence of three distinct strains of the causal organism (*Phytophthora cinnamomi*, which in agreement with Mehrlich [ibid., xv, p. 378] he regards as a synonym of *P. cambivora*). The optimum temperature for the growth of all three strains lies between 25° and 27·5° C., but one (No. 17), pathogenic to rhododendrons, consistently withstood high (35°) and low (5°) extremes better than the others. This strain further tolerates a hydrogen-ion concentration of P_H 4·25, at which *R. ponticum* grows better than at lower acidities. In addition to No. 17 the writer distinguishes a strain from *Erica* sp. (New York) and No. 14 (Mehrlich's 466) from Hawaiian pineapples.

PAPE (H.). **Eine noch wenig beachtete Krankheit der Zierpflanzen.** [An as yet little heeded disease of ornamentals.]—*Blumen- u. PflBau ver. Gartenwelt*, xlii, 32, pp. 384–386, 2 figs., 1938.

Hosts of *Phytomonas fascians* [*R.A.M.*, xvii, p. 732] in Germany are stated to include *Chrysanthemum indicum*, *C. maximum*, *Pelargonium zonale*, *Heuchera sanguinea*, *Asparagus sprengeri*, *Buddleia variabilis*, and *Verbascum vernale*. Gall-like accumulations of short, thickened, sometimes banded shoots develop at the stem bases and mostly produce only stunted leaves. So far the disease is without practical importance, the maximum incidence of infection recorded (in *C. indicum*) being 0·5 per cent.

SPRAGUE (R.). **Two Mastigosporium leaf spots on Gramineae.**—*J. agric. Res.*, lvii, 4, pp. 287–299, 5 figs., 1938.

The author considers *Mastigosporium album* var. *calvum* specifically distinct from *M. album* Riess [*R.A.M.*, xvi, p. 230] for the following

reasons: (1) the spores of *M. album* have appendages and four or five cross walls, whereas those of *M. album* var. *calvum* have no appendages and only three cross walls; (2) the former are usually longer and sometimes narrower than the latter; (3) the two fungi maintain their respective characteristics in culture; and (4) the host range of each is fairly distinct. He accordingly proposes to raise *M. album* var. *calvum* to specific rank as *M. calvum* (Ell. & Davis) n. comb. and cites as synonyms *M. album* var. *muticum*, *Fusoma rubricosa* Dearn. & Barth. [apparently the earliest specific name], and *Amastigosporium graminicola*. *M. album* occurs on *Alopecurus pratensis* and *Deschampsia caespitosa* in Europe, but has not been reported from North America. *M. calvum* is widespread on a number of grasses in Europe and America. In northwestern Oregon it is a destructive parasite during mild, rainy weather in the winter and spring, causing a purple flecking and a leaf spot on *Dactylis glomerata* and an eye spot on the leaves of several species of *Agrostis*. In Wisconsin it occurs on species of *Calamagrostis*. The results of inoculation studies indicate that apart from differences in host range *M. calvum* comprises several distinct physiologic races. It is proposed to amend the genus *Mastigosporium* so as to include fungi with short, stipitate conidiophores bearing elliptical, 3- to 5-septate, hyaline, appendaged or not appendaged conidia. No evidence was obtained that *Dilophospora alopecuri* [ibid., xvi, p. 184] is related to *M. album* or *M. calvum*. *M. album* var. *athrix* Eriks. is assigned to *Septogloeum* as *S. athrix* (Eriks.) n. comb. and is believed to be probably identical with *S. oxysporum*.

PARODI (L. R.). **Ustilago perennans parásito de Arrhenatherum elatius cultivado en la Facultad de Agronomía de La Plata.** [*Ustilago perennans*, a parasite of *Arrhenatherum elatius* cultivated at the Faculty of Agronomy of La Plata.]—*Rev. argent. Agron.*, v, 3, p. 188, 1938.

Arrhenatherum elatius [*A. avenaceum*], a fodder grass cultivated for experimental purposes at the La Plata Faculty of Agronomy, has been observed on several occasions since 1923 to be attacked by *Ustilago perennans* [*R.A.M.*, xii, p. 294], not previously recorded from the Argentine.

EKSTRAND (H.). **Sclerotium rhizodes, en på gräs förekommande ofullständigt känd sclerotiesvamp.** [*Sclerotium rhizodes*, an imperfectly known sclerotial fungus occurring on grasses.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1938*, pp. 39–41, 1 fig., 1938.

Attention is drawn to the recent occurrence on *Agrostis stolonifera* in Sweden of *Sclerotium rhizodes* [*R.A.M.*, xiv, pp. 39, 766], previously reported in the same country on *A. tenuis* (which is also attacked by the fungus in Norway) and *Calamagrostis lanceolata*. Affected leaves curl up, wilt, and assume a bleached appearance, while the leaf sheaths may also wither, panicle development is arrested, and sometimes the entire shoot ceases to grow. The circular to oblong sclerotia of the fungus measure up to 2 mm. in diameter and resemble those of certain *Typhula* species, e.g., *T. graminum*, to which, according to I. Jørstad, some of the damage really due to *S. rhizodes* is commonly attributed in Norway.

Jones (F. R.). **A seed-borne disease of Sweet Clover.**—*Phytopathology*, xxviii, 9, pp. 661–662, 1938.

In addition to the well-known black stem disease of sweet clover (*Melilotus* spp.) caused by *Mycosphaerella* (*Ascochyta*) *lethalis* [*R.A.M.*, xiii, p. 32], the crop is also occasionally attacked by a less familiar species of *Ascochyta*, *A. caulicola*, recorded in Germany in 1903 (*Arb. biol. Anst.* (*Reichsanst.*) *Berl.*, iii, p. 441) but apparently not hitherto described from the United States. The present report is based both on the examination of herbarium material of 1921 and subsequent years and on field observations in Kansas, Nebraska, Iowa, Illinois, and Wisconsin during 1937. In marked contrast to the blackening of the stems caused by *M. lethalis*, *A. caulicola* produces bleached areas, sometimes surrounded by a brown margin, and accompanied in vigorously growing plants by a bending of the stalks, suggesting the name 'gooseneck' for the disease. Unlike *M. lethalis*, a sparsely fruiting fungus, *A. caulicola* forms a profusion of conspicuous pycnidia on the lesions as soon as they appear. Both fungi may often be found on the same plant. *A. caulicola* has been isolated from all parts of *Melilotus* except the roots, and plants grown from infected seed, though appearing healthy during the winter in the greenhouse, developed numerous lesions about a fortnight after exposure to rainy outdoor conditions, showing that the fungus is to some extent systemic.

Ramsey (G. B.), Bratley (C. O.), & Wiant (J. S.). **Diseases of fruits and vegetables observed on the Chicago and New York markets in 1937.**—*Plant Dis. Reptr, Suppl.* 106, pp. 62–82, 1938. [Mimeographed.]

Brief notes are given on a large number of diseases of fruit and vegetables observed in the Chicago and New York markets (by G. B. Ramsey, and by C. O. Bratley and J. S. Wiant, respectively) in 1937.

Joëssel (P. H.), Lidoyne (A.), & Pampillon (F.). **Trois années d'essais de traitements contre la chlorose des arbres fruitiers.** [Three years of experiments with treatments against chlorosis of fruit trees.]—*Ann. Épiphyt.*, N.S., iii, 2, pp. 231–246, 1937. [Received October, 1938.]

In continuation of the experiments carried out during the two previous seasons in the south of France on the control of fruit tree chlorosis [*R.A.M.*, xv, p. 515], the authors in 1936 treated 100 affected peach trees by Mokrzecki's and Rassiguier's methods [loc. cit.], using iron pyrophosphate (citro-ammoniacal), ferric potassium tartrate, ferric ammonium citrate, ferric ammonium oxalate, and ferric potassium oxalate. The dosages used for Mokrzecki's method corresponded to 1 gm. or $\frac{1}{3}$ gm. of iron, according to the age of the tree, and for Rassiguier's method a concentration giving the same amount of iron as a 30 per cent. solution of iron sulphate; the iron pyrophosphate and ferric potassium oxalate were used in saturated solution.

Great improvement followed the treatments with ferric ammonium oxalate, with no appreciable injury to vegetation, and this salt could advantageously be used to replace the ferric ammonium citrate, which caused severe injury. Ferric potassium oxalate had a slower and less marked effect than the other salts tested.

A number of severely affected 7-year-old William pear trees were also treated by Mokrzecki's method, using ferric potassium tartrate, iron pyrophosphate, ferric ammonium citrate, ferric ammonium oxalate, and ferric potassium oxalate. One day after the treatment the oldest leaves showed burnt areas and shortly after began to fall, though the young leaves remained uninjured, except on the trees treated with the citrate, which became completely defoliated. All the other treatments subsequently gave greatly improved foliage, as compared with the controls, the fruit ripening normally.

It is concluded that the use of iron salts, especially ferric potassium tartrate, iron pyrophosphate, and ferric ammonium oxalate, restores the green colour of chlorotic peach and pear trees and, for a time, their productive capacity. Insertion of the salts in holes in the trunk gives more marked and lasting results than the painting of pruning wounds or spraying during the vegetative period, but all three methods should be used concurrently, where necessary. On slightly affected trees, or immediately before harvesting, to avoid crop loss, resort may be had to spraying with ferrous ammonium sulphate. In all other cases Mokrzecki's or Rassiguier's method should be used, the latter on very young trees. The dosage recommended is 1, $\frac{1}{2}$, and $\frac{1}{3}$ gm. of iron for trees 8 to 12, 6 to 8, and 3 to 6 years old, respectively.

McWhorter (O. T.). **Zinc treatments for little leaf.**—*Bett. Fruit*, xxxii, 10, p. 5, 1938.

Brief, popular notes are given on zinc treatments used successfully against little leaf of deciduous fruit trees in Oregon since 1933 [*R.A.M.*, xvi, p. 817; xvii, pp. 327, 376]. Old, affected stone fruit trees should be sprayed just before the buds swell with zinc sulphate (50 lb. per 100 gals., or 25 or 30 lb. per 100 gals. if the condition is not severe). Young trees may receive the same treatment during dormancy, but if the dormant spray has been omitted or has failed to give complete control, the foliage should be sprayed about one month to six weeks after it has appeared with zinc sulphate (20 to 25 lb. per 100 gals.), plus one-third as much hydrated lime which should be soaked in water for some hours and added as milk of lime. This spray should be applied early in the morning or late in the afternoon.

Zinc injections, made by boring $\frac{3}{8}$ in. holes $1\frac{3}{4}$ in. deep and 4 to 5 in. apart round the base of the tree, just under the ground line, filling them with powdered zinc to within $\frac{1}{2}$ in. of the outside, and sealing with grafting wax, in the autumn or very early winter, have never failed to give beneficial results, which last about three years. Zinc tacks have given very good results on young cherry, peach, and apricot trees. Zinc strips as used in California have proved difficult to drive into the trees. Zinc dusts and soil treatments are not recommended.

Nightingale (Alice A.). **Some chemical constituents of Apple associated with susceptibility to fire-blight.**—*Bull. N.J. agric. Exp. Stas* 613, 22 pp., 4 figs., 1936. [Received November, 1938.]

A tabulated account is given of experiments in the growth of *Erwinia amylovora* on the extracted juice of apple trees of different varieties in New Jersey, the results of which, though admittedly incomplete, are

thought to justify the conclusion that the development of the organism depends more closely on the relative concentration and equilibrium of the carbohydrate and nitrogenous compounds within the host tissue than on the comparative water content or extent of resistance offered by the physical nature of the host cells. A relatively low carbohydrate, and high nitrogen content was correlated with susceptibility, and the reverse with resistance to fireblight [*R.A.M.*, xv, p. 814].

The growth of the bacterium in test tubes on agar prepared with juices extracted from hard and soft trees of several varieties, including Henry Clay (reputedly resistant), English Codling (more susceptible), McIntosh, Delicious, and Stayman, confirmed the data obtained from greenhouse inoculations on trees receiving complete or non-nitrogenous nutrient solutions. *E. amylovora* developed well on agar made from succulent twigs, low in carbohydrates and high in organic nitrogen, but grew poorly or not at all on that prepared from hard material with a high carbohydrate and low nitrogen content. The addition of asparagin to the hard twig medium favoured the growth of the organism, while the incorporation of sugar with soft twig juice agar acted adversely on its development.

Loewel (E. L.) & Friedrich (G.). **Fusikladiumbeobachtungen an eingetüteten Apfelzweigen während der Vegetationsperiode.** [Observations on *Fusicladium* on enclosed Apple twigs during the vegetation period.]—*Gartenbauwiss.*, xii, 2, pp. 121–126, 1 fig., 1938.

With the object of determining the part played by ascospores in the early infection of apple trees with *Fusicladium* [*Venturia inaequalis*: *R.A.M.*, xvii, p. 606] shoots of the varieties Boskoop, Coulon, Signe Tillisch, Gravenstein, Echter Glockenapfel, and Echter Boiken were enclosed in waterproof bags before the beginning of the period of ascospore discharge in Altenland, Germany. During this period (from the beginning of April till the end of May) each of the bags on each tree was removed in turn for a few days and replaced again, except for a few bags which remained on the shoots all the time. At the end of the experiment all bags were removed and the lesions on the leaves counted. It was found that shoots exposed at times of maximum ascospore discharge showed less infection than those exposed at times of less abundant discharge, and the shoots which had remained in the bags all the time and had, therefore, been entirely protected from ascospores showed the greatest number of infected leaves. It is concluded, therefore, that the infection originated from mycelium or spores which must have been present on the shoots prior to the period of ascospore discharge. The bases and petioles of infected leaves showed the oldest lesions, indicating that the infection might have spread from the branch. No scabbed lesions or spore pustules were observed on the shoots before the experiments. Further investigations are in progress.

Marchionatto (J. B.). **El 'corazon mohoso' de la Manzana. Nota preliminar.** ['Mouldy core' of the Apple. Preliminary note.]—*Rev. argent. Agron.*, v, 3, pp. 179–186, 2 pl., 1 fig., 1938.

A brief account is given of a condition of apples which an inspection at the beginning of 1938 showed to be fairly widespread in the orchards

of the upper valley of Rio Negro and Neuquen in the Argentine, and which is very similar to that described from the United States, Canada, New Zealand, and Australia under the names *Alternaria* rot, blossom-end rot, core mould, or mouldy core. Locally it was found to be apparently caused by a fungus which, by its morphological and biological characters, is identified as *Alternaria mali* [*R.A.M.*, x, pp. 227, 674]. Affected fruits, especially the highly susceptible Red Delicious variety, colour more rapidly than normal, and are often asymmetrical; they remain attached to the tree for a long time, falling only when the internal lesion is serious and involves the pulp. Evidence is adduced indicating that severe spring frosts are the main factor predisposing the fruit to infection, though the fungus may also be distributed by larvae of certain insects, e.g., *Bryobia praetiosa*. In the Argentine the disease was found on the varieties Delicious, Red Delicious, Gravenstein, Stayman, Winesap, and Jonathan, the two first-named varieties often showing 15 to 30 per cent. infection. The only method of control that has proved satisfactory is the prevention of frost damage by artificial heating of the orchards, but it is also recommended that affected fruits should be gathered immediately to prevent transmission of the infection to sound fruit. Cold storage of the harvested crop has been found to arrest the progress of the disease. [An abridged English version of this paper is published in *Int. Bull. Pl. Prot.*, xii, 9, pp. 189–191, 1938.]

Goldsworthy (M. C.) & Smith (M. A.). **The comparative importance of leaves and twigs as overwintering infection sources of the Pear leaf-blight pathogen, Fabraea maculata.**—*Phytopathology*, xxviii, 8, pp. 574–582, 1938.

Pear and quince leaf blight (*Fabraea maculata*) [*R.A.M.*, xvii, p. 188] is commonly present in the middle-western and eastern parts of the United States and has been reported from other parts of the country. The ascigerous stage has not been found on overwintered pear leaves in Maryland or Missouri; in these two States the conidia overwinter on diseased leaves and occasionally on bark cankers, but not on diseased fruits. Experimental evidence demonstrated that conidia overwintered on diseased leaves may cause spring infections, which are not, however, important sources of spread. In Maryland and Missouri the fungus overwinters mainly as mycelium in bark cankers. This forms acervuli late in winter, and in early spring conidia are produced, and escaping through cracks in the bark, infect the unfolding leaves; they are also washed downward through the tree, and set up cone-shaped tracts of infection in the leaves below the cankers. Conidia escaping from the leaf lesions may infect the young bark of the growing stems at any time during the growing season. The mycelium overwinters in some of these bark infections, the life-cycle of the organism being completed when conidia are produced on them in the following spring.

Hildebrand (E. M.) & Palmiter (D. H.). **X-virus disease of Peaches in New York.**—*Plant Dis. Reptr*, xxii, 13, p. 268, 1938. [Mimeographed.]

On 24th June, 1938, 'X disease' of peaches [*R.A.M.*, xvi, p. 21],

which has caused concern in Connecticut for five years, was identified in Columbia County, New York. In the infected orchard, out of the original planting of over 600 trees, about 120 remain, and of these 22·5 per cent. are diseased. A hedge containing affected chokecherries (*Prunus virginiana*) was present on two sides of the field. The affected peaches showed a heavy shedding of shot-hole leaves, progressing from the base towards the tips of the shoots, while the leaves remaining on the trees showed water-soaked to reddish spots and shot hole. Shaking the branches caused more leaves to drop. Similar symptoms but without leaf fall were shown by the affected chokecherries, on which also otherwise apparently normal leaves were turning yellow and red.

Moshkov [Moshkoff] (B. S.). **Photoperiodism and immunity.**—*C. R. Acad. Sci. U.R.S.S.*, N.S., xix, 9, pp. 751–754, 1 fig., 1 graph, 1938.

In experiments on photoperiodism the author observed variations in the degree of infection of the test plants by disease under the different conditions, particularly in the case of rose mildew [*Sphaerotheca pannosa*], gooseberry mildew [? *S. mors-uvae*], and cereals affected with brown rust [*Puccinia triticina*] and mildew [*Erysiphe graminis*]. In a study on the relationship between photoperiodic conditions and the development of infection of black-currant leaves by *Cronartium ribicola* [*R.A.M.*, xvii, p. 758], exposure of the leaves for periods of 10 to 17 hours each day resulted in different degrees of infection by the fungus. Leaves exposed for more than 17 hours remained perfectly clean, those given 17-, 16-, 15-, 14-, 13-, 12-, 11-, and 10-hour days showed 5, 10, 50, 75, 100, 40, 10, and 5 per cent. of the leaf surface affected, respectively, and those exposed for less than 9 hours a day remained uninjured throughout the whole season. This explains why under natural conditions in Leningrad the teleutospores of *C. ribicola* develop only in the autumn, when the day length is less than 16 hours. From these data the author concludes that immunity of plants from fungus parasites may depend upon the changes in the leaves induced by photoperiodic conditions.

Boresch (K.). **Über die Blattrandkrankheit der Johannisbeere mit einem Ausblick auf die Entstehung von Mangelchlorosen.** [On the marginal leaf scorch of Red Currant with reference to the development of deficiency chloroses.]—*Gartenbauwiss.*, xii, 2, pp. 176–233, 17 figs., 1 graph, 1938.

Almost complete control of marginal leaf scorch of red currants [*R.A.M.*, xvi, p. 545], a disease ascribed to potassium deficiency, was achieved in field experiments, carried out for six years on poor soils, when potassium sulphate, potassium nitrate, or dipotassium hydrogen phosphate was applied to the Dutch Red variety at a rate equivalent to 65 gm. potassium oxide per plant; the application of potassium chloride, on the other hand, produced severe symptoms of a very similar type of disease, attributed to excess of chlorine. The same amount of chlorine applied as ammonium chloride was not so harmful since ammonium salts favour the formation of chlorophyll, as is clearly seen from the deep green foliage of currant bushes treated with ammonium sulphate, an effect which was greater than that induced by

nitrates. In the absence of potassium, sodium chloride was the most harmful of the sodium salts, sodium nitrate less so, and sodium sulphate the least. In field experiments with the Kirsch currant variety the harmful effect of potassium chloride was successfully arrested by the addition of ammonium salts.

In pot experiments with the Dutch Red variety potassium deficiency was again successfully controlled by the addition of potassium sulphate, potassium nitrate, and even potassium chloride, provided the chlorine did not exceed 1·503 gm. per pot. Sodium chloride was beneficial when potassium was deficient, whereas ammonium and multivalent ions, especially magnesium, enhanced the effects of potassium deficiency. The addition of large quantities of chlorine was deleterious particularly in combination with sodium, less so with calcium, still less with ammonium, and least with magnesium. Excess of chlorine produced a chlorosis, developing from the margin towards the middle of the leaf with the formation of necrotic spots at a certain distance from the margin, and leading to a brown withering and premature death of the leaves. In general, the symptoms appeared at an earlier date and became more acute than those due to potassium deficiency and were controlled by the addition of ammonium nitrate.

Analyses of leaves of healthy and diseased currants showed that marginal leaf scorch appeared when the potassium content of the whole leaf sank slightly under 1 per cent. of the dry substance, and became more severe the further the percentage fell. It was seen from a comparison of healthy and recently diseased leaves that the chlorosis caused by chlorine develops only when chlorine ions are present in excess of potassium ions, and the author considers that there is a close ionic interrelationship between this condition and potassium deficiency. He argues that the direct cause of marginal leaf scorch cannot arise from a disturbance of the water balance of the leaf or a fixation of iron due to potassium deficiency, but that it must be sought, in accordance with the observations of K. Noak and Pirson, in the photo-oxidative destruction of chlorophyll associated with the disturbance of the normal assimilation process induced by the lack of potassium. It is possible that diseases of other plants caused by deficiency of potassium or other elements, such as iron or manganese, may be explained on a similar photodynamic basis.

Wann (F. B.) & Richards (B. L.). **The effect of P_H on two Strawberry root rot fungi.**—*Proc. Utah Acad. Sci.*, xiv, pp. 45–46, 1937. [Abs. in *Exp. Sta. Rec.*, lxxix, p. 498, 1938.]

From the results of tests here briefly described it appears that the two strawberry root-rotting fungi, *Fusarium orthoceras* [*R.A.M.*, xvi, p. 822] and *F. solani*, may be partially controlled in Utah by the adjustment of the soil reaction to a P_H value corresponding to their minimum growth.

Hirai (T.). **Diseases of the Banana in transport from Formosa.**—*Ann. phytopath. Soc. Japan*, viii, 2, pp. 145–165, 9 figs., 2 graphs, 1938. [Japanese, with English summary.]

Wastage in bananas in transport from Formosa is estimated to

amount to about 2 per cent. of the total of discharging cargoes, equivalent to 300,000 yen per annum [1 yen = 2*s.* 0½*d.* at par]. Diseases account for 87 per cent. of the wastage, of which 59 per cent. is non-infectious and 28 per cent. infectious.

The former group is represented in these studies by the conditions known as green-ripeness and 'kaze-hiki' due to excessively high and abnormally low temperatures, respectively, while the latter includes the following disorders: main stalk rot (comprising *Ceratostomella paradoxa* [*R.A.M.*, xv, p. 451], *Botryodiplodia theobromae* [loc. cit.], also associated with black rot, *Gloeosporium musarum* [loc. cit. and ibid., xvii, p. 50], likewise concerned in finger-dropping and anthracnose, and *Fusarium* spp.), sclerotial disease (*Corticium centrifugum*), black spot (*Macrophoma musae*), and grey mould (*Rhizopus nigricans*).

B. theobromae and *G. musarum* made scarcely any growth at 11° C., and *Ceratostomella paradoxa* developed scantily and slowly, so that the maintenance of this temperature in refrigerated transport appears to offer a promising means of combating the diseases under review.

WHITE (R. P.). **Studies on the adhesiveness of sulfur residue on foliage.** —*Bull N.J. agric. Exp. Stas* 611, 21 pp., 18 graphs, 1936. [Received November, 1938.]

A tabulated account is given of the writer's studies at the New Jersey Agricultural Experiment Stations on the adhesiveness of sulphur residues on foliage, primarily with a view to the control of black spot [*Diplocarpon rosae*: *R.A.M.*, xvii, p. 821] and crown canker of roses [*Diaporthe umbrina*: ibid., xv, p. 722]. The following aspects of the problem were given special consideration: the influence of spray amendments (commonly known as 'spreaders' or 'stickers') on (*a*) the wetting properties of the spray fluid, (*b*) the original deposit of sulphur, (*c*) the mechanical loss and resulting residue, and (*d*) the rate of loss of the residue.

The data presented clearly indicate that the ability of sulphur suspensions to wet foliage is in general correlated with the surface tension of the continuous phase of the suspensoid, though with certain types of leaves, e.g., those of beet and snapdragon [*Antirrhinum majus*], exceptions to this rule occur, and various other discrepancies suggest that the chemical relationship between the leaf cuticle and the continuous phase of the suspensoid may also be involved.

The total deposit of the discontinuous phase of suspensoids of equal concentrations is dependent on the surface tension and the wetting capacities of the spray. Suspensoids with low surface tension or high wettability spread over the treated area in a thin film, and additional spray runs off, leaving a minimum of the discontinuous phase on the surface after drying. Conversely, suspensoids with high surface tension or low wettability may fail to wet the foliage at all, resulting in complete run-off and no deposit of the discontinuous phase. The sulphur suspensoids used in these tests had a variable surface tension. Amendment 2 (1 per cent. solution coco-nut fatty acid soap), which lowered the surface tension of water by 63·3 per cent. and wetted mature rose (Magna Charta) foliage with a thin film, consistently decreased the

amount of the original deposit of sulphur as compared with 13 (commercial wheat flour, 6 lb. per 50 gals.), which lowered the surface tension of water by only 14 per cent. and wetted rose leaves with a continuous thick film. Complete wetting of young rose foliage was ensured by the addition to the sulphur spray of the following amendments: (No. 1) 1 per cent. salt of a sulphonated carboxylic acid, (3) 1 per cent. of (1) plus over 50 per cent. inert diluent, (4) sodium lauryl sulphate, 1 in 1,000, (5) 1 per cent. sodium oleyl sulphate [ibid., xvii, p. 193], and (6) a mixture of resinous materials, 1 in 1,000, which reduced the surface tension of water by 65·9, 60·8, 52·2, 50·7, and 50·7 per cent., respectively.

A certain amount of the original deposit is mechanically lost with the first precipitation following drying of the spray. The greater the original deposit, the greater will be the total mechanical loss, due to the removal of the larger sulphur particles loosely attached to the leaf surface. With larger deposits, however, a greater number of colloidal particles will be deposited on the foliage, some of which will escape washing-off and remain available for protective purposes. The use of amendments with low surface tension, tending to decrease the original deposit, results in a run-off corresponding in part to the mechanical losses of heavier deposits. Following the initial mechanical loss, subsequent losses are independent of precipitation and directly correlated with time.

Lime-sulphur (1 in 49) deposited on rose foliage a larger amount of sulphur and retained more of it subsequent to mechanical loss than did flotation or precipitated sulphurs or a bentonite-sulphur. The original deposit of sulphur was further increased by the addition of a proprietary wettable sulphur. A greatly augmented deposit can be obtained with sulphur dusts but the mechanical losses are correspondingly increased, the residues after these have occurred approximating to those following the use of flotation-sulphur or a bentonite-sulphur mixture.

The type of foliage sprayed directly influences the original deposit and the residue, but appears to play little or no part in subsequent losses, which were equal in tests on peach, rose, and apple leaves.

Lawrence (W. J. C.) & Newell (J.). **Experiments on seed and potting composts. VI. A new method of steam sterilization.**—*Gdnrs' Chron.*, civ, 2696, p. 165, 1938.

A new, convenient and economical method of high-pressure steam sterilization of soil [*R.A.M.*, xvii, p. 475] for pot plants is described, in which, using steam at a pressure of 80 lb. per sq. in., 12 bush. of soil (over $\frac{1}{2}$ cu. yd.) spread 18 in. deep are heated to 212° F. in three or four minutes. The steam is then shut off, and the hot soil allowed to remain in the sterilizing bins for 20 to 25 minutes more, sterilization being completed by the residual heat of the soil. The loss of heat is relatively small if the soil is kept covered with sacking. This method reduces the amount of steam required by 80 per cent., allows a much smaller boiler to be used, and gives a much drier soil than does continuous steaming. If two or three bins are used large amounts of soil can be sterilized in one day with considerable economy and efficiency.

Handbuch der Pflanzenkrankheiten. Sechster Band. Pflanzenschutz. Verhütung und Bekämpfung der Pflanzenkrankheiten. [Handbook of plant diseases. Volume VI. Plant protection. Prevention and control of plant diseases.]—Lieferung 2, pp. 289–576, 61 figs., Berlin, P. Parey, 1938. RM. 16.60 (foreign countries RM. 12.45).

The present instalment of the sixth revised edition of Sorauer's 'Handbook of Plant Diseases', issued under the general supervision of Dr. O. Appel [*R.A.M.*, xvi, p. 478], contains the conclusion of W. Trappmann's section on physical methods of control and valuable, comprehensive contributions on chemical (inorganic and organic) plant-protectives by W. Trappmann, G. Hilgendorff, A. Winkelmann, W. Fischer, and W. Tomaszewski; the biological testing of plant- and foodstuff-protectives by A. Winkelmann and H. Klinger; and physical and chemical methods of testing by G. Hilgendorff and W. Fischer (incomplete).

Reed (H. S.). **Cytology of leaves affected with little-leaf.**—*Amer. J. Bot.*, xxv, 3, pp. 174–186, 17 figs., 1938.

The author investigated the cytological conditions of leaves of apricot, peach, tomato, maize, squash, mustard, and buckwheat affected with little leaf [*R.A.M.*, xvi, p. 682; and above, p. 36]. In comparison with healthy leaves the cells of the palisade parenchyma of affected leaves were larger but less numerous, and in the tomato there was marked atrophy of the mesophyll. The cell structure of affected leaves of certain plants exhibited a lack of differentiation resulting in an essentially juvenile or, perhaps, xerophytic type of leaf. The disease is characterized by destruction of the chloroplasts or by inhibition of their development, the cells receiving most illumination showing the greatest plastid injury. Hypoplastic conditions were often associated with agglutination of the plastids, which became vacuolated and shrunken, and, except in the peach, usually devoid of starch. The factors producing this derangement appear to be quite localized since adjacent cells may show none of these symptoms. Lytic factors associated with the disease frequently destroyed most of the cell contents in more or less extensive areas. Phenolic substances were present in affected, especially acutely affected, leaves of some plants (e.g., apricot) but not of others (e.g., maize) and were also present in old healthy leaves of certain plants. The endodermal cells of affected apricot and peach leaves were replete with phenolic substances, which showed, however, little tendency to diffuse, and in the case of senescent peach and apricot leaves plant gums were present. Species showing leaves dwarfed by the disease contained more tannin.

Zinc salts may possibly act by catalysing the oxidation processes and in their absence biochemical reactions may proceed in the reverse direction. Tannin may also impede oxidation and these two factors may account for much of the derangement of the leaf cells. The fibro-vascular system of affected leaves showed on the whole fewer derangements than the cells of the palisade and mesophyll layers and it is concluded, therefore, that the disease is associated with metabolism rather than with conduction.

Proctor (B. E.) & Parker (B. W.). **Microbiology of the upper air. III. An improved apparatus and technique for upper air investigations.**—*J. Bact.*, xxxvi, 2, pp. 175–184, 2 pl., 1938.

Full technical details are given of an improved apparatus, termed a 'bioaercollector', for the collection of micro-organisms from the upper air, which has been successfully used in 40 aeroplane flights over greater Boston (Massachusetts) from November, 1936, to June, 1937, when the following moulds were obtained at altitudes between 1,500 and 16,500 ft. [cf. *R.A.M.*, xv, p. 167]: *Aspergillus niger*, *A. glaucus*, *A. flavus*, *A. calyptratus*, *Macrosporium* sp., *Penicillium frequentans*, *Cladosporium* sp., *Hormodendrum* [*C.*] *herbarum*, *P. glabrum*, and *P. lanosum*.

Henderson Smith (J.), Andrewes (C. H.), Bawden (F. C.), Bernal (J.), McFarlane (A. S.), & Garrod (L. P.). **Discussion on recent work on heavy proteins in virus infection and its bearing on the nature of viruses.**—*Proc. R. Soc. Med.*, xxxi, 3, pp. 199–210, 1938.

This is an interesting critical and analytical discussion of the recent work by Stanley, Wyckoff, and others on heavy proteins in relation to virus (especially tobacco mosaic) infection, and on the application of the resultant data to the problem of the nature of viruses [*R.A.M.*, xvii, p. 761]. The writers' conclusions may be briefly summed up as follows. J. Henderson Smith thinks all the evidence to date is in favour of the view that the protein is the actual virus, since any procedure that removes the protein lowers infectivity, the activity of the virus is destroyed by the same temperature or degree of acidity or alkalinity as the protein, the hypothetical virus contaminant must have the same isoelectric point and molecular weight as the protein, and in short there is no means of dissociating one from the other.

C. H. Andrewes considers it obvious that the viruses possess certain properties hitherto associated with autonomous living entities and others formerly regarded as inherent in non-living chemical substances. This does not, however, necessarily imply a transition from the non-living to the living, a more plausible view being that the viruses are micro-organisms which have gradually declined in size and lost (to their own advantage) some of the chemical complexities of larger beings and at the same time become subject to physico-chemical laws entailing such processes as the formation of paracrystals. The fact that the viruses can, under certain conditions, arrange themselves in regular rows like other heavy proteins does not, in the writer's opinion, counterbalance such evidence of life as is afforded, e.g., by their immunological properties, resembling those of bacteria, their capacity to form haptenes or multiply in an insect intermediate host, their adaptability to altered conditions, and their graded series of sizes, larger in some instances than cultivable organisms.

F. C. Bawden gives a résumé of his reasons for believing that the nucleoproteins isolated from tobacco mosaic, tomato enation and aucuba mosaics, cucumber viruses 3 and 4, and potato virus X [ibid., xvii, p. 764] are the viruses themselves.

J. D. Bernal's optical and X-ray investigation of Bawden's preparations of tobacco mosaic and the cucumber and potato X viruses

shows that all contain long particles, accounting for the double refraction of flow [see below, p. 61] of the dilute solution, the spontaneous double refraction of the more concentrated solution, and the formation of double refracting gels and spindle-shaped tactoid bodies. Stanley's 'crystals' are in all probability really microtactoids, indistinguishable from 'wet gel', containing about 50 per cent. water, formed by drying the concentrated solution. Traditional views as to the vital nature of the viruses would seem to be definitely contradicted by the evidence of large-angle scattering, corresponding to the arrangement of a semi-crystallized protein, obtained by X-ray photography of the virus preparations, which shows unequivocally the occurrence of perfect three-dimensional regularity within the particles, persisting unchanged from the driest gel to the most dilute solution. The scale of this regularity (of the order of 20 Å.) is much smaller than any particle hitherto claimed to represent a living organism, and is intermediate in character between that observed in undenatured and denatured proteins.

A. S. McFarlane points out that one particle or molecule of tobacco mosaic protein consists of a number of units (amino-acids or polypeptide chains), in the fixed mutual relationship of a crystal lattice. Crystallographic measurements reveal a virtual absence of water within each particle, while centrifugal calculations point to a close similarity in the size of the molecules, features tending strongly to disprove one of the main arguments for the organic nature of these structures, i.e., the manifestation by the particles in contact with the living plant of infectivity and proliferative capacity.

L. P. Garrod thought one of the arguments adduced by C. H. Andrewes in favour of the living nature of viruses could be refuted, namely the production of immunity by virus infections. Non-living substances could excite specific antibody formation, and it was not difficult to picture a precipitin-like action as the basis of acquired immunity from virus diseases.

Bojanovsky (R.). **Absolute Reinkulturen von Pilzen aus Speziesreinkulturen durch Ionenzuchtwahl (phyletisches Ionenphänomenon).** [Absolutely pure cultures of fungi from specifically pure cultures by means of selective effect of ions (phyletic ion-phenomenon).]—*Zbl. Bakt.*, Abt. 2, lxxxxix, 1–4, pp. 55–60, 2 graphs, 1938.

The author states that by using nutrient media containing 4·86 per cent. potassium thiocyanate (0·5 mol concentration) he succeeded in freeing cultures of a cellulose-destroying fungus isolated from soil, from contaminating bacteria. He also demonstrated the possibility of suppressing the growth of bacteria, artificially introduced into pure cultures of *Aspergillus niger*, by the addition to the substratum of aluminium sulphate up to a concentration of 0·03 mol.

Young (J. E.). **Exposure of fungus organisms to ultraviolet rays.**—*Proc. Ind. Acad. Sci.*, xlvii, pp. 93–95, 1938.

Cultures of *Sclerotium rolfsii* and *Macrosporium* [*Alternaria*] *solani* on potato dextrose agar were exposed to ultra-violet irradiation by a Hanover quartz-mercury arc vapour lamp at a distance of 25 cm.

[see next abstract]. The initial effect of the rays was a retardation of growth, *S. rolfsii* being particularly sensitive. After ten hours, however, more than normally vigorous growth was resumed, characterized by aerial mycelium arising from profuse branching of swollen hyphal tips. This effect is tentatively attributed to the accumulation in the bulbous tips of growth-promoting hormones.

Gier (L. J.). **Effects of ultrashort radio waves and ultraviolet light on microörganisms.**—*Trans. Kans. Acad. Sci.*, xl, pp. 55–57, 1938.

Cultures of *Bacterium vesicatorium* [*R.A.M.*, xvi, p. 655], *Actinomyces scabies*, *Saccharomyces* spp., *Alternaria solani* [see preceding abstract], *Cephalosporium* sp., *Diplodia zeae*, and *Gibberella saubinetii* on potato dextrose agar were incubated for 24 hours at room temperature and then exposed in an aluminium irradiation chamber with bakelite spacers to wave-lengths of 27 to 45 cm. for periods ranging from 4 to 217 hours.

Bact. vesicatorium was killed in all cultures except one at 35 cm. after exposure for 24 hours and upwards. Exposures up to 49 hours at 45 cm. produced no effect on *Actinomyces scabies*, while *S.* spp. (on nutrient and potato dextrose agars) showed no difference after 120 hours at 35 and 45 cm. At 45 cm. *Alternaria solani* and *C.* sp. became slightly stunted after more than 72 and 48 hours, respectively. A faint bleaching of *D. zeae* was apparent after 120 to 217 hours at 35 cm. *G. saubinetii* displayed much sectoring after 48 hours at 29 cm., and was smaller and paler after the same period at 37 cm.

Concurrently with the ultra-short wave experiments, cultures of *A. solani*, *G. saubinetii*, and three strains of *F. moniliforme* [*G. fujikuroi*] were exposed to a General Electric mercury vapour lamp of the Hanover type without filters, suspended at a height of 28 cm. above the centres of the culture dishes. Notwithstanding precautions against excessive heating of the cultures the temperature rose to a maximum of 68° C. after an hour of treatment. Cultures of *A. solani* exposed for 5 and 10 minutes showed exceptionally profuse sectoring, while longer treatments resulted in severe stunting or killing. After 10 minutes' exposure, spores of the fungus in a hanging drop of sterile tap water germinated as well as similar non-irradiated cultures, but after 24 hours all growth had ceased in the former while proceeding normally in the latter. *G. saubinetii* and *G. fujikuroi* responded to the treatment by a darkening of colour from pale cream to purple-black, but sectoring occurred only in one strain of the latter exposed for 20 minutes on each of three successive days.

The writer concludes from these experiments that plant diseases may possibly respond to radio wave treatment, but since the requisite wave-length probably varies with each organism, considerable experimental work would be necessary to ensure successful results. The effects of unfiltered violet light may be largely or entirely due to heat.

Van Luijk (A.). **Antagonism between various microorganisms and different species of the genus Pythium, parasitizing upon Grasses and Lucerne.**—*Meded. phytopath. Lab. Scholten*, xiv, pp. 43–82, 6 pl., 1938.

These studies on the antagonism between various micro-organisms

and *Pythium volutum*, *P. de Baryanum*, *P. intermedium*, *P. irregulare*, and *P. mamillatum* were made in series of experiments *in vitro* and in pots; all these species were parasitic on *Lolium annuum* var. *westerwoldicum*, *Festuca duriuscula*, and *Agrostis stolonifera* [cf. *R.A.M.*, xiv, p. 240], and *P. de Baryanum* was also parasitic on lucerne. The antagonistic organisms, separately or in combination, were tested with the parasite and host together or the parasite alone in culture.

In pot inoculation experiments with *P. volutum* on *A. stolonifera* the infection was much stronger in sterile than in non-sterile soil, the presence of the parasite reducing the average dry weight of the plants per pot, measured at the end of the experiment, from 17·31 to 3·96 gm. in the sterile, and from 9·68 to 6·57 gm. in the non-sterile soil. This result is ascribed to the influence of the antagonists present in the non-sterilized soil. *P. volutum* and *P. de Baryanum* proved to be the most virulent of the parasites tested. In experiments with *P. volutum* and several unspecified parasites and saprophytes on *F. duriuscula* it was found that parasites may be even stronger antagonists than saprophytes. The substances inhibiting the growth of *P. de Baryanum* were studied by adding filtrates prepared from one-month-old cultures of *Pullularia pullulans* to the cultures of *Pythium de Baryanum*. It appeared that the filtrates from cultures of *Pullularia pullulans* grown at 4° to 15° C. inhibited development considerably, but those grown at 14° to 21° hardly at all. The growth-inhibiting substances were neutralized when exposed to a temperature of 100°. When *Pullularia* cells were separated from their metabolic products by filtering, and a suspension of these cells in Knop saccharose was heated in boiled water, diluted to various strengths, and inoculated with *Pythium de Baryanum*, stimulation of growth occurred in almost every case. From these results the author concludes that the growth-inhibiting substances formed by *Pullularia pullulans* are thermolabile and are present in the filtrate, while substances stimulating growth are thermostable and are probably chiefly present in the cells.

In experiments with pots and large glass tubes under non-sterile conditions in the open air, filtrates of *P. pullulans* showed no antagonistic effect, but the presence of *Pullularia* cultures almost completely prevented the infection of *L. annuum* var. *westerwoldicum* with *Pythium de Baryanum*, the average dry weight of grass per tube in the control being 1,650 mg., in the tubes inoculated with *P. de Baryanum* 760 mg., and in tubes inoculated with *P. de Baryanum* and *Pullularia pullulans* 1,637 mg. *Pythium* spp. may also be mutually antagonistic under non-sterile conditions.

Experiments were then carried out with various fungi isolated from soil suspensions and added to tubes containing *A. stolonifera* inoculated with *P. volutum*. After 22 days the control tubes yielded 88 healthy plants (from 100 seeds), those inoculated with *P. volutum* only 19, and those inoculated with *P. volutum* plus a sterile mycelium or *Verticillium cinnabarinum* [*Acrostalagmus cinnabarinus*] 59 and 45, respectively. Stimulation of the germination of *F. duriuscula* followed the addition of a *Mucor* to the culture tubes.

In another series of experiments the liquid filtrates from cultures of a wide range of organisms were sterilized at 102° for 5 minutes and

inoculated with *P. de Baryanum*. The growth of the fungus up the tubes after 4 days was 50 or 51 mm. in the controls whilst that in filtrates of *V. cinerescens* [ibid., xvi, p. 726], *A. cinnabarinus*, *P. irregulare*, and *P. mamillatum* reached 0, 17, 36, and 53 mm., respectively. In further experiments it appeared that *Penicillium expansum* was the strongest antagonist of *Pythium de Baryanum* and one strain of it, 18a, inhibited the growth of *P. de Baryanum* in dilutions up to 1 : 128 [ibid., xvii, p. 617]. When a number of carbon sources were used in synthetic liquid media on which strain 18a was grown, the mono- and disaccharides (with the exception of lactose) provided media with the greatest inhibitive effect on the growth of *Pythium de Baryanum*, the polysaccharides being decidedly weaker. From these results it is concluded that the inhibiting substances are metabolic products of carbon compounds.

In discussing the possibilities of combating plant diseases by antagonistic organisms the author states that the formation of toxins by the latter in soil will largely depend on the environmental factors. The application of filtered or sterilized cultures or even of inhibiting substances isolated from them is therefore thought to promise better results. The advantage over organic disinfectants lies in the fact that the metabolic products of *Penicillium expansum* may be applied to either artificially inoculated or infected, non-sterilized soil a few days before sowing without damaging the seedlings.

Sempio (C.). **Primo contributo alla conoscenza dell' azione esercitata da vari fattori ambientali su alcune malattie parassitarie di piante coltivate ('ruggine del Fagiolo').** [First contribution to the knowledge of the action exerted by various environmental factors on some parasitic diseases of cultivated plants (Bean rust).]—*Riv. Pat. veg.*, xxviii, 7–8, pp. 241–351, 11 figs., 17 graphs, 1938.

A full account is given of experiments carried out to determine the effect of various environmental factors on the host-parasite relationships between Cinquantino giallo beans and *Uromyces appendiculatus* [cf. *R.A.M.*, xvi, p. 49]. The inoculated plants were placed under bell jars during the following periods, viz., from the first to the third or fourth day after (and including) the day of inoculation, from the third or fourth to the sixth day, and from the seventh to the ninth or tenth day. A further series was incubated for the whole period, and two lots of controls were kept under bell jars for the first 48 hours and for the whole period, respectively. The optimum temperature for the development of the rust was found to be 19° to 20° C. and between 14° and 24° no differences could be observed in the behaviour of the rust on the plants incubated for these different periods.

At temperatures from 26° to 28° plants incubated for the third period showed the greatest susceptibility to infection and this period would appear to be a critical one for the disease. When, however, the same plants were kept for a further six or seven days at 15° to 20° the leaves regained their normal colour. The evidence showed that for plants exposed to temperatures of about 27° during the third period the susceptibility to infection of the tissues farthest away from the infection centres and not directly invaded was increased, while the invaded tissues tended to lose their susceptibility. Temperatures of

34° to 36° completely sterilized well-developed mycelium present in the leaves in 2½ days, without appreciable injury to the plant tissues, when the treatment was applied four days after inoculation, though plants in which the mycelium was so sterilized on two consecutive occasions were not immune from further attack.

When inoculated plants were immediately exposed to carbon dioxide at concentrations of 8·28 and 9·66 per cent., the gas markedly retarded infection in all three periods of incubation, while the resistance of the fungus to the toxic effect of the gas increased progressively from the first to the third period, the strong toxic effect of the gas in the first period being due to its direct action in inhibiting germination. In another series of experiments, in which plants in the first period were exposed to concentrations of 7 to 9·5 per cent. of the gas 18 hours after inoculation, the second stage was much more susceptible to the action of the gas than the first or the third. The author considers that the gas affects the metabolism of the plant rather than the fungus itself.

Absence of light did not adversely affect the disease during the first period, but retarded it during the third. Red, yellow, and green light (applied through colour screens) had no appreciable effect, but blue light definitely reduced infection.

When the plants were exposed daily for progressively increasing periods (totalling 28 to 30 minutes) to ultra-violet radiation, in all three periods of infection, the upper, irradiated leaf surfaces showed no, or very few, pustules, while the surfaces not directly exposed developed a normal number of pustules, and the leaves screened from the rays showed the same amount of infection as the controls.

During the 20 to 24 hours after inoculation, a high degree of relative humidity was necessary for infection to develop rapidly. At other times, especially in the third period, the disease made most progress at relative humidities of about 70 per cent.

It is concluded that, on the whole, the third period of infection is the most critical. In the first period the plant is usually more resistant to unfavourable environmental factors than during the other periods.

AJROLDI (R.). **Influenza di micromiceti sulla germinazione e sullo sviluppo di piante ortensi.** [The influence of micromycetes on the germination and development of horticultural plants.]—*Ital. agric.*, lxxv, 8, pp. 519–587, 5 figs., 1938.

Neither culture filtrates nor mycelial extracts of *Fusarium bulbigenum* var. *lycopersici* and *Alternaria brassicae* exerted any significantly adverse effects on the germinative capacity and energy of tomato and cabbage seed, respectively, in experiments at the Institute of Plant Pathology, Milan University. On the other hand, they produced chlorosis, feeble stem growth, stunting of the aerial organs, atrophy of the piliferous zone, and necrosis of the root tissues in seedlings when brought into direct contact with the root systems. The injurious influence of the filtrates increased *pari passu* with the age of the cultures, whereas the mycelial extracts were most active in the early stages of development. It would appear from these observations that the toxic action of *F. bulbigenum* var. *lycopersici* and *A. brassicae* on their respective hosts is primarily of a chemical nature, being associated

with the metabolic changes induced by the fungi in the various constituents of the substratum.

GARRARD (E. H.) & LOCHHEAD (A. G.). **Relationships between soil micro-organisms and soil-borne pathogens. A review.**—*Sci. Agric.*, xviii, 12, pp. 719–737, 1938.

This is a full review of the present state of knowledge of the possible relationships of soil saprophytes to soil-borne organisms producing disease in plants, the points dealt with including root rot investigations, inhibitive action of species of *Trichoderma* [*R.A.M.*, xvi, p. 268 *et passim*], the action of protozoa, the mechanism of antagonism, toxins, lysis, enzymes, staling, soil acidity, and 'growth factor'. A bibliography of 100 titles is appended.

KÖHLER (E.). **Die wichtigsten Kartoffelkrankheiten und ihre Bekämpfung.** [The most important Potato diseases and their control.]—*Arb. Reichsnährst.* 44, 64 pp., 1 col. pl., 28 figs., 3 maps, 1938.

In addition to a number of well-known fungal, bacterial, insect, and physiological disorders affecting the potato crop in Germany, the writer gives a popular account of the following viruses involved in the etiology of 'degeneration': mild mosaic (caused by virus X), a mosaic attributed to virus A (which in combination with X can also cause streak or crinkle), streak (Y), leaf roll of two types, viz., leaf roll proper, carried by *Myzus persicae*, and leaf-rolling mosaic (Z) [*R.A.M.*, xv, p. 460], not transmissible by this aphid, and stunting. Notes are also included on 'Eisenfleckigkeit' and 'Pfropfenbildung' [spraing: ibid., xiii, p. 650; xvii, p. 410]. Control measures are concisely indicated.

GARBOWSKI (L.). **Choroby wirusowe Ziemniaków.** [Virus diseases of Potatoes.]—98 pp., 6 col. pl., Bydgoszcz, Wyd. państw. Inst. Nauk. Gosp. wiejsk. w Puławach, 1938.

In part I of this booklet on the virus diseases of potatoes the present status of knowledge on the physical, chemical, and biological properties of viruses in general is discussed; part II, dealing only with potato viruses, is planned on the lines of the corresponding chapter from the 'Text-book of plant virus diseases' by K. M. Smith [*R.A.M.*, xvii, p. 52], whose system of classification is adopted; and in part III, the practical aspects of the diagnosis of virus diseases, the preparation of healthy seed material, and the breeding of resistant varieties are presented. A disease resembling spindle tuber has been observed in Poland [cf. ibid., vi, p. 572], but the author states that it is uncertain whether the disorder is due to a virus or to physiological causes.

DYKSTRA (T. P.) & WHITAKER (W. C.). **Experiments on the transmission of Potato viruses by vectors.**—*J. agric. Res.*, lvii, 5, pp. 319–334, 5 figs., 1938.

Details are given of experiments from 1932 to 1934 in Oregon, in which the transmission was studied under muslin-covered cages in the field of potato virus diseases by four species of aphids (*Myzus persicae* [*R.A.M.*, xvii, pp. 763, 834], *M. circumflexus*, *M. pseudosolani*, and *Macrosiphum solanifolii*) and some other insects. The results showed

that all the aphids tested can serve as vectors of leaf roll, rugose mosaic, crinkle mosaic, and mild mosaic. With the exception of leaf roll, a much higher percentage of transmission of the viruses occurred when the aphids had continuous access both to diseased and healthy plants than when they were transferred directly from the former to the latter, suggesting that the mosaic viruses may retain their virulence inside the aphids only for a short time. Direct transference of the three *Myzus* species from leaf roll to healthy plants usually resulted in a high percentage of transmission of the disease, but *Macrosiphum solanifolii* generally failed to transmit it by this method, although this species was occasionally able to transmit a fairly high percentage of leaf roll. In many cases the three *Myzus* species, when transferred from plants infected with a combination of leaf roll and one of the potato mosaics, failed to transmit the latter. The fact that, while the *Myzus* species at times transmitted different potato viruses, they often failed to transmit the same viruses under apparently similar conditions, suggests that the reason may be physiological, and that perhaps such factors as light, temperature, or humidity may influence the virus within the aphid. Since in practically all the cases observed these three species fed consistently in the phloem region of the plants, it appears that the variation in results cannot be explained by their feeding habits. Mild and crinkle mosaics were transmitted from potato to tobacco by *Myzus circumflexus*, *M. pseudosolani*, and *Macrosiphum solanifolii*, although in many cases the results were negative. As few as five aphids per plant were sufficient to cause infection.

All the other insects naturally feeding on the potato, namely, *Lygus pratensis*, *Epitrix subcrinata*, *Empoasca filamenta*, *Philaenus leucophthalmus*, and *Nabis alternatus*, failed to show any transmission of the potato viruses studied.

OLDAKER (C. E. W.). **Blight (Phytophthora infestans) of Potatoes in Tasmania.**—*Tasm. J. Agric.*, N.S., ix, 3, pp. 134–137, 1938.

The author briefly reviews the history of potato blight (*Phytophthora infestans*) in Tasmania from its first appearance in 1906 until the present time [*R.A.M.*, xi, p. 322]. Infection increased in scope and intensity in 1908, and in 1910, in spite of vigorous spraying, heavy losses were sustained. In 1911, the disease swept the country, and the Red Skin variety, mainly grown until that date, was replaced by a new resistant variety of unknown origin, Brownell; the spring and summer of 1914 and 1915 were dry and sunny, and for the next ten years, although spraying was gradually dropped, the disease virtually disappeared, except in the north-west, where a susceptible variety was still grown. In 1926–7 the principal early variety, Bismarck, became affected in some localities. Since then, sporadic outbreaks have occurred from time to time, but infection has not been serious enough to arouse more than local concern. In some districts, heavy losses (50 to 60 per cent. or even more on Bismarck) have been incurred during the current year. An increase in yield of 30 per cent. resulted in one instance after three spray applications at intervals of three weeks during the infective stage.

Goss (R. W.) & Afanasiev (M. M.). **Influence of crop rotations under irrigation on Potato scab, Rhizoctonia, and Fusarium wilt.**—*Bull. Neb. agric. Exp. Sta.* 317, 18 pp., 5 graphs, 1938.

Most of the results so far obtained in the course of observations in Nebraska, initiated in 1912, on the influence of crop rotation on the incidence of potato scab [*Actinomyces scabies*], *Rhizoctonia* [*Corticium solani*], and *Fusarium* wilt [*F. oxysporum* and *F. solani* var. *eumartii*] have already been summarized from another source [*R.A.M.*, xvi, p. 488]. Although the effect of some of the crop sequences varied with different diseases, the rotations resulting in the least infection were the same for all three diseases, and also produced the best yields. The best results were obtained with four- and six-year rotations with lucerne preceding the potato crop, and the least satisfactory as regards both disease and yield were obtained from maize and potato rotations or continuous culture of potatoes. In short rotations the addition of farmyard manure increased the amount of scab, but reduced the amount of *Rhizoctonia* and doubled the yield.

Walker (J. C.), Larson (R. H.), & Albert (A. R.). **Studies of resistance to Potato scab in Wisconsin.**—*Amer. Potato J.*, xv, 9, pp. 246–252, 1938.

Tabulated data are presented and discussed showing the marked influence of the environmental complex on varietal reaction to potato scab (*Actinomyces scabies*) [*R.A.M.*, xvii, p. 199 *et passim*] in three localities of Wisconsin in three consecutive seasons (1935 to 1937). Thus, in 1935 Early Ohio and Beauty of Hebron were significantly less scabby than three other early varieties tested, whereas in the following year this difference did not hold good either in the silt loam soil of Antigo or in a scab-infested muck soil near Delavan. In the late maturing group the range of infection at Antigo in 1935 accorded with the commonly accepted commercial rating of the varieties on trial, Green Mountain and Chippewa being very susceptible, Russet Burbank highly resistant, and Rural New Yorker and Russet Rural intermediate. In 1936 the greater severity of the disease in the same locality practically removed the significance of any varietal differences, though Chippewa retained the maximum scab incidence (Green Mountain was not tested in this season) and Russet Burbank the lowest. At Arnott (sandy loam), where the disease assumed only a moderate form in 1936, the same general varietal order was observed as at Antigo in 1935. At Delavan in 1937 two Russet Rural strains were appreciably more resistant than two Rural New Yorkers. Of the non-commercial varieties tested in 1937, Lady Llewellyn and Hindenburg×Centifolia 15 were outstandingly free from scab, Wee McGregor and Vick's Early about equally susceptible with Green Mountain and Irish Cobbler, and Sutton's Reliance, Early Rose, Gold Nugget, Brown Beauty, and Golden intermediate. White-Blossomed Cobbler and Earlaine were substantially less affected than Irish Cobbler.

Metzger (C. H.). **A new Potato disease in Colorado.**—*Amer. Potato J.*, xv, 8, pp. 225–230, 1938.

A potato disease believed to be bacterial wilt (*Bacterium solana-*

cearum) [*R.A.M.*, xvii, p. 700] made its appearance in 1937 in Colorado, where the Bliss Triumph variety contracts more extensive tuber rot from this cause than Irish Cobbler. Combined aerial and tuber symptoms were observed on Rural New Yorker, while the tubers of Brown Beauty, Red McClure, Russet Burbank, and Katahdin were also affected. It is thought that unduly late cultivation or hilling may have contributed to the spread of the disease through extensive root injury.

Burkholder (W. H.). **The occurrence in the United States of the tuber ring rot and wilt of the Potato (Phytomonas sepedonica—(Spieckermann u. Kotthoff) Bergey et al.).**—*Amer. Potato J.*, xv, 9, pp. 243–245, 1938.

The organism isolated from a yellowish rot of cheesy consistency in the vascular area of potato tubers from Maine in January, 1938, was a Gram-positive, non-motile rod, 1·25 by 0·72 μ, forming on a special medium of 1 l. potato broth, 5 gm. peptone, 2 gm. each of sodium phosphate and sodium chloride, 1 gm. sodium citrate, 6 gm. each of asparagin and dextrose, and 12 gm. agar, cream-coloured, wet, glistening, somewhat sticky colonies, not liquefying gelatine, producing a little hydrogen sulphide, slightly hydrolysing starch, and reducing but not clearing litmus milk: it is identified as *Bacterium sepedonicum* [*R.A.M.*, xvii, p. 586]. Inoculation experiments on Green Mountain potatoes gave positive results, the causal organism being reisolated from the diseased material.

Hill (L. M.) & Orton (C. R.). **Microchemical studies of Potato tubers affected with blue stem disease.**—*J. agric. Res.*, lvii, 5, pp. 387–392, 7 pl., 1938.

An account is given of comparative microchemical studies of healthy Russet Rural potato tubers and of tubers of the same variety affected with the disease recently described by the authors from West Virginia and since become known as blue stem [*R.A.M.*, xvii, p. 552] because of the characteristic discoloration of the stems during the later stages of the disease. It was found that in the necrotic regions of the phloem and parenchyma, the cellulose and pectic cell walls were partially masked by a deposit of suberin, on the removal of which with an oxidizing solvent the cellulose walls remained intact. Tests for cellulose and lignin in necrotic xylem gave positive results. A suberin-like substance present in necrotic phloem, parenchyma, and xylem was soluble in Schultze's reagent and gave a positive test for cerin. In the necrotic regions and 'zones' (areas of definite extent around the necrotic regions) the starch grains were partially or totally dissolved, and were replaced by a higher concentration of glucose, the sucrose content remaining unchanged; protein, tyrosin, and solanin were absent; and fat was uniformly distributed throughout the healthy tubers and in the zones of the diseased tubers, but none was found in the necrotic areas. Nitrates were absent from the necrotic areas and the zones, while iron and oxidase were concentrated in the latter, and phenol was detected in the cell walls of the necrotic areas. Calcium, potassium, and magnesium, phosphates, chlorides, and sulphates were determined in very small quantities in both healthy and diseased tubers.

ELISEI (F. G.). **Primo reperto in Italia del Fusarium moniliforme Sheld. parassita del Riso (Oryza sativa L.).** [First discovery in Italy of *Fusarium moniliforme* Sheld., a parasite of Rice (*Oryza sativa* L.).] —Reprinted from *Atti Ist. bot. Univ. Pavia*, Ser. IV, xi, 12 pp., 7 figs., 1938. [Latin summary.]

In August, 1938, the author received from Novara adult rice plants of the Giovanni Roncarolo variety which showed yellowing of the stem and leaves due to *Fusarium moniliforme* (*Gibberella fujikuroi*) [*R.A.M.*, xvii, p. 769]. This is stated to be the first record of a rice disease resembling 'bakanae' in Italy.

WAKSMAN (S. A.). **Humus: origin, chemical composition, and importance in nature. Second edition.**—xiv+526 pp., 4 figs., 40 graphs, London, Baillière, Tindall & Cox, 1938. 30*s*.

New features of this revised edition of the author's treatise [cf. *R.A.M.*, xv, p. 526] include references to the extensive Russian literature on the subject and the addition of further information on the relation of organic matter to soil conservation.

SCHROPP (W.). **Beiträge zur Kenntnis der Kalimangelerscheinungen bei einigen Öl- und Gespinstpflanzen.** [Contributions to the knowledge of potash deficiency symptoms in some oil- and fibre-yielding plants.]—*Ernähr. Pfl.*, xxxiv, 10, pp. 165–170; 11–12, pp. 181–186, 14 figs., 1938. [English and Spanish summaries on pp. 180, 204.]

Particulars are given of the author's laboratory and field observations and experiments at the Institute of Agricultural Chemistry, Weihenstephan, Bavaria, on the symptoms of potash deficiency in certain oil- and fibre-yielding plants grown on various types of soil. In colza and rape the shortage induced marked retardation of shoot growth, poor leaf development, and foliar malformation and discoloration. Potash-deficient poppies [*Papaver officinale*] were characterized by a darkening of the leaf colour, belated flowering, and general stunting of the plants. White mustard [*Brassica alba*] plants receiving no potash developed thick, squat stalks, inward curling of the leaf margins, and brown spotting of the leaf surfaces. Similar features were typical of *Camelina sativa* and oil radish (*Raphanus oleiferus*) deprived of the necessary potash supply. Soy-beans also reacted to the absence of the essential nutrient by brown spotting of the foliage and inward curling of the margins, the young leaves in addition displaying an abnormally dark discoloration. The potash requirements of castor oil (*Ricinus communis*) being exceptionally high, a shortage of this element results in arrest of growth, reduction in leaf size, foliar discoloration, and inward curling of the margins. Flax, hemp, and jute plants receiving an inadequate potash supply all produce abnormally dark-coloured foliage; in the first-named the tips of the lower leaves later turn brown, branching is excessive and flowering delayed, while in the case of hemp the leaves present a convex appearance similar to that of a watch glass and the margins become brown.

Varadaraja Iyengar (A. V.). **Contributions to the study of spike disease in Sandal (Santalum album, Linn.). Part XIX. Physiological and physical methods of characterising the disease.**—*J. Indian Inst. Sci.*, xxi A, 8, pp. 89–101, 5 figs., 1 graph, 1938.

Healthy sandal (*Santalum album*) plants growing under adverse conditions were observed in several localities in India to produce small, narrow leaves resembling those affected by spike disease [*R.A.M.*, xvii, p. 626]. An attempt was made, therefore, to evolve a simple and reliable method for the identification of the disease. The methods previously used, e.g., the transmission of infection by grafting, or the recognition of X-bodies in spiked leaves, are too lengthy and complicated for immediate diagnosis in the field, while the microscopic examination of spiked leaves for the presence of excessive starch is quite misleading, since the starch content was found to be influenced by environmental conditions. The author compared the calcium: nitrogen ratio in normal and spiked sandal leaves from five different localities, examining 12 trees in each case, and found that it was consistently lower in the spiked leaves, the figures for healthy leaves and those showing advanced spike being 1·32 and 0·29, 1·01 and 0·35, 0·96 and 0·31, 0·94 and 0·28, and 1·28 and 0·27, respectively. These results were confirmed when the calcium: nitrogen ratio was estimated for specimens collected over a period of 12 weeks. The ratio nitrogen: ash was lower in leaves in the early stage of the disease and higher in those in an advanced stage and cannot, therefore, serve as a diagnostic character. Biometric measurements of the entire length of leaf blade including the petiole (L), petiole length (P), and the maximum breadth of leaf blade (B) were 63·2, 23·1, and 9·4 mm., respectively, in healthy leaves and 23·5, 6·2, and 2·3 mm., respectively, in fully spiked leaves from Bangalore, similar values being obtained for leaves from two other localities. The ratios L/B and $\frac{L-P}{B}$ are consequently significant diagnostic factors. Another striking feature of the diseased plant is a reduction of the internodal distance from between 16·4 and 29·8 mm. in the healthy plants, to between 3·1 and 7·2 mm., and, moreover, the internodes were set at quite regular intervals, unlike those of healthy plants. Neither the ratio L/B, the length of the petiole, nor the internodal distance alone was sufficiently reliable in identifying the disease, but a combination of the three was invariably satisfactory.

Brien (R. M.). **Black root-rot of Hops.**—*N.Z.J. Sci. Tech.*, A, xx, 1, pp. 62–64, 2 figs., 1938.

The fungus isolated from hops suffering from black root rot in Nelson Province, New Zealand, in 1936 was identified by S. F. Ashby as *Phytophthora cactorum*, apparently not previously recorded on this host. The first symptom of the disease is a rapid yellowing and wilting of the foliage, usually when the plants are coming into flower, followed by a brown discoloration of the leaves and death of the plants. Sharply defined black lesions, 3 to 12 in. long, were found completely encircling the decayed roots. Positive results were given by field and greenhouse inoculation tests in which pure cultures of the organism were introduced

into the roots either through the soil or by way of incisions near the crown.

Obando (N.). **Algunas consideraciones sobre la nueva enfermedad de la Caña de Azucar.** [Some considerations on the new Sugar-Cane disease.]—*Agricultura, Bogotá*, x, 12, pp. 362–363, 1938.

Energetic measures, based on plant quarantine and the investigation and propagation of resistant varieties, have been planned by the Department of Agriculture, Colombia, for the control of sugar-cane mosaic [see above, p. 12], which has caused a substantial reduction in yields since 1935.

Yamamoto (W.). **Some sooty moulds on Sugar Cane.**—*Ann. phytopath. Soc. Japan*, viii, 2, pp. 96–112, 16 figs., 1938. [Japanese, with English summary.]

At least three different species of sooty moulds appear to be associated with the aphid *Ceratovacuna lanigera* on sugar-cane leaves in Formosa, namely, the olivaceous (*Fumago vagans* Pers.) [cf. *Caldariomyces fumago*: *R.A.M.*, xi, p. 404], the black (*C. fasciculatus* n.sp. [with English and Latin diagnoses]), and the brownish (*Hypocapnodium* sp.).

F. vagans is characterized by simple, erect, yellowish- to dark brown, 3- to 16-septate conidiophores, more or less geniculate above, bearing concatenate, acropleurogenous, ellipsoid, ovoid, or oblong, continuous or uni-, rarely biseptate, pale fuscous to dark olive conidia, 5 to 16 by 3 to 6·5 μ, occasionally up to 23 μ, and by gemmoid, irregularly ellipsoid, ovoid, oblong, or subglobose, generally bi- to pluriseptate, olivaceous to dark brown, thick-walled chlamydospores, 7 to 23 by 5 to 19 μ.

The branched conidiophores of *C. fasciculatus* are aggregated into simple or rarely branched synnemata, tapering upwards, but more or less swollen at the apex, simulating pycnidia, 210 to 476 by 22 to 41 μ (at the base); and bear ellipsoid or ovoid, continuous, hyaline conidia, 4·3 to 7·8 by 2·2 to 4·3 μ; the gemma-like, irregularly ellipsoid, oblong, or ovoid, dark olive, continuous or uniseptate chlamydospores measure 7 to 16 by 3·5 to 8 μ.

Inoculations on potted sugar-cane seedlings with a solution of 5 per cent. mixed honey dew and 2·5 per cent. peptone containing conidia from onion agar cultures resulted in the formation of patches similar to those arising under natural conditions and bearing the typical conidia of the organisms concerned.

Sydow (H.). **Novae fungorum species—XXVI.** [New species of fungi—XXVI.]—*Ann. mycol., Berl.*, xxxvi, 2–3, pp. 156–197, 1938.

This is a critically annotated list [cf. *R.A.M.*, xvi, p. 839] of 33 new species of fungi [with Latin and German diagnoses] collected by F. C. Deighton in Sierra Leone and C. G. Hansford in Uganda. An appendix furnishes similar information in respect of five Asterineae listed by Hansford in his current contributions [cf. ibid., xvii, p. 415] to the parasitic fungi of Uganda.

Sydow (H.). **Neue oder bemerkenswerte australische Micromyceten—III.** [New or noteworthy Australian micromycetes—III.]—*Ann. mycol., Berl.*, xxxvi, 4, pp. 295–313, 1938.

In this critically annotated list of 24 new or otherwise remarkable Australian fungi, the author erects 6 new genera and 18 new species [with Latin diagnoses]. *Septoria polyadelpha* Syd. n.sp. forms greenish-grey lesions, often covering almost the entire surface, on the leaves of *Brassica sinapistrum* [charlock: *B. sinapis*] in the Pennant Hills, New South Wales, usually causing shrivelling and death. The fungus is characterized by pycnidia 70 to 150 μ in diameter, the outer walls pale yellow to olive-brown, the inner ones hyaline; branched, septate hyphae, 3 to 5 μ in width; and broadly filiform, obtusely rounded, more or less vermiform, or falcate to curved, rarely almost straight, uni- to triseptate, hyaline conidia, 22 to 30 by 2 to 2·5 μ.

Tobisch (J.). **Beiträge zur Kenntnis der Pilzflora von Kärnten. V.** [Contributions to the knowledge of the fungus flora of Carinthia. V.]—*Öst. bot. Z.*, lxxxvii, 4, pp. 273–315, 1938.

In this further contribution to a series of critical annotations on the fungus flora of Carinthia, Austria, the author records *Ascochyta pteridis* causing a blackish-brown discoloration of bracken (*Pteridium aquilinum*) fronds and stems, rapidly followed by the death of the affected parts; the conidia measure 12 to 20 by 4 to 6 μ. Living *Malus* [*Pyrus*] leaves are attacked by *Asteroma mali* Desm., which produces circular, blackish lesions, 3 to 5 mm. in diameter, with black, branched fibrils radiating outwards from the centre. The brown pycnidia of the fungus measure about 100 μ in diameter and are furnished with a short, obtusely papillate ostiole; the dimensions of the ellipsoid, oblong, or ovoid conidia are 4 to 7 by 2·5 to 3 μ. *Sphaeropsis ellisii* on pine (*Pinus sylvestris*) needles and their supporting twigs is comparable with *Diplodia pinea* [*R.A.M.*, xvii, pp. 150, 573] but in the author's material the conidia were invariably unicellular [cf. ibid., xvi, p. 148]. *Colletotrichum nigrum* occurs on ripe chilli (*Capsicum annuum*) capsules [ibid., xvii, p. 346].

Mundkur (B. B.). **Fungi of India. Supplement I.**—*Sci. Monogr. Coun. agric. Res. India* 12, 54 pp., 1938. Rs. 1–6 or 2*s.* 3*d.*

This supplement to Butler and Bisby's Fungi of India [*R.A.M.*, xi, p. 545] adds 433 records of Eumycetes, making a total of 2,784, and 90 records of Myxomycetes. *Mycosphaerella tinosporae* Ajrekar n.sp. is described as the perfect stage of *Cercospora tinosporae* Syd. *Peronospora gäumannii* Mundkur nom. nov. is a new name for *P. indica* Gäum. (non Syd.) on *Argemone mexicana*. *Cerebella sorghi-vulgaris* Subramaniam, *Vermicularia bakeri* Syd., and *Phaeosaccardinula butleri* (Syd.) Theiss. & Syd. are renamed, respectively, *C. volkensii* (P. Henn.) Mundk. n.comb., *Colletotrichum bakeri* (Syd.) Mundk. n.comb., and *Chaetothyrium butleri* (Syd.) Mundk. n.comb. Additional notes or corrections are given for several fungi previously recorded for India. A bibliography of 134 titles and an index of genera are appended.

Ciferri (R.). **Mycoflora domingensis exsiccata (Cent. III, No. 201–300.).** [Exsiccata of the Dominican mycoflora (Cent. III, Nos. 201–300).]—*Ann. mycol., Berl.*, xxxvi, 2–3, pp. 198–245, 1938.

This critically annotated list of 124 species, varieties, or forms of fungi on 116 hosts, based on the examination of 120 exsiccata of collections in the Dominican Republic [cf. *R.A.M.*, xi, p. 604], contains 2 new genera and 32 new species [with Latin diagnoses]. Most of the species are stated to be new to the country and a few to the Americas. The following items may be mentioned. *Pseudoperonospora cubensis* is very prevalent on cultivated and semi-wild squashes. *Elsinoe canavaliae* [*E. phaseoli*] occurs on *Phaseolus lunatus* [ibid., xiii, p. 345].

Referring to the subdivision of *Meliola* by the late F. L. Stevens into four genera, viz., *Meliola*, *Irenina*, *Irene*, and *Irenopsis*, on the basis of the presence or absence of perithecial or mycelial setae or vermiform perithecial appendages [ibid., vii, p. 743], the author, while accepting this method of classification, proposes to reduce the genera to subgenera. These ideas will be further developed in a paper dealing with Dominican Meliolineae; in the meantime a key is furnished showing the subgenera, sections, and subsections arranged according to their morphological characters.

Septobasidium spongia is widespread on oranges, usually in conjunction with other species of the same genus, and with or on scale insects. *Melia azedarach* leaves are attacked by *Cercoseptoria domingensis* n.sp., which causes polygonal to polygonoid or irregular, white to greyish spots 2 to 4 mm. in diameter, with a brownish halo ½ to 1 mm. wide. A leaf spot of *Argemone mexicana* is caused by the fungus hitherto known as *Cladosporium guanicensis* (*Trans. Ill. Acad. Sci.*, x, p. 207, 1917), but for which the name *Polythrincium guanicense* (Stev.) Cif. n.comb. is proposed, even though the agreement with *P.* [*Dothidella*] *trifolii* [*R.A.M.*, iv, pp. 96, 396, 446; xvii, p. 440] is not complete. *Cercospora viciae* and *C. rosicola* occur on cultivated *Lathyrus* and roses [ibid., xvii, p. 112], respectively.

Bitter orange leaves, twigs, and fruits are liable to infection by *Sphaceloma citri* (Butl.) Cif. n.comb. (syn. *Sporotrichum citri* Butl., *Sphaceloma fawcettii*).

A new form of *Rhizoctonia* [*Corticium*] *solani*, *R. solani* f. *paroketea*, differing from the type in its peculiar habitat, the apparent absence of a *Moniliopsis* stage [ibid., xvii, p. 183], and some secondary morphological characters, is found in the starch residues of cassava roots.

Hirata (K.). **A general view on the host range of powdery mildews.**—*Ann. phytopath. Soc. Japan*, viii, 2, pp. 170–178, 1938. [Japanese.]

A tabulated conspectus is given of the reaction of nearly 100 families of the Dicotyledoneae and four of the Monocotyledoneae to infection by seven genera of the Erysiphaceae, viz., *Erysiphe*, *Leveillula*, *Sphaerotheca*, *Microsphaera*, *Podosphaera*, *Uncinula*, and *Phyllactinia*. A two-page bibliography is appended.

Bitancourt (A. A.) & Jenkins (A[nna] E.). **New species, hosts, and distribution records of Elsinoë and Sphaceloma.**—*Chron. bot.*, iv, 4–5, pp. 388–389, 1938.

A list is given of hosts belonging to 24 families (in addition to undetermined hosts) on which species of *Elsinoë* and *Sphaceloma* have been recorded since the publication of the authors' previous list [*R.A.M.*, xvii, p. 70], the locality where the record was made being indicated in each case.

Couch (J. N.). **The genus Septobasidium.**—480 pp., 115 pl., 20 figs., 2 graphs, Univ. N. C. Pr., Chapel Hill, 1938. $5.00.

This monograph presents detailed descriptions with photographs and line drawings of about 175 species of *Septobasidium* [*R.A.M.*, xv, p. 58]. Of these about 90 are re-descriptions of the old original types, most of which have never been adequately described or illustrated, 27 are descriptions of species, which have already been described by the author, and 55 are new species [but without Latin diagnoses]. The volume further contains a discussion of the fungus-insect relationship, and of the pathological considerations and control methods; data on geographical distribution, host trees, and host insects; sections on structural features of taxonomic importance, hybridization, and cytology; and a key to the species.

Ulbrich (E.). **Die von der deutschen Himalaya-Expedition 1937 gesammelten Pilze.** [The fungi collected by the German Himalaya expedition of 1937.]—*Notizbl. bot. Gart. Berl.*, xiv, 122, pp. 139–150, 1938.

A critically annotated list is furnished of twelve fungi collected by Prof. C. Troll, geographer and botanist of the German Himalaya expedition, at an altitude of 2,500 to 4,500 m. above sea-level in the Nanga Parbat region of the Kashmir Gilgit Dependency. One new genus (*Trolliomyces*) is included, based on *T. rosae* (Barcl.) n.comb. (*Puccinia rosae*) on roses [*R.A.M.*, xiii, p. 185], the malodorous pycnospores of which probably serve to attract the insect visitors acting as spore carriers. *Chrysomyxa pyrolae* [ibid., xi, p. 214] was detected on the foliage of *Pyrola rotundifolia*, and *Melampsora salicis-wallichianae* n.sp. on the young leaves and female catkins of *Salix wallichiana*, both in the uredo stage only. Slight swellings on juniper branches bore teleutosori of *Gymnosporangium confusum* [ibid., xi, p. 145]. *Aecidium colchici-aurei* n.sp. occurred on the leaves of *Colchicum aureum*, this being apparently the first record of the aecidial stage of a rust on *Colchicum*. Latin diagnoses are given for the new genus and species. Attention is drawn to the general floristic, ecological, and biological resemblances between the fungi studied and those recently described by Nattrass from Cyprus [ibid., xvii, p. 346].

Dufrénoy (J.). **Les conceptions actuelles sur les virus du Tabac.** [The present conceptions regarding the viruses of Tobacco.]—*Ann. Epiphyt.*, N.S., iv, 2, pp. 267–279, 5 figs., 2 diags., 1938.

The author reviews recent literature [most of which has been noticed in this *Review*] dealing with the structure and chemical and optical

properties of the nucleoproteins present in the tissues of tobacco plants affected with tobacco viruses no. 1, no. 6, or 'enation virus', as well as with their inactivation by heat or by chemical reagents. He suggests that proteinases may play a part in the multiplication of the virus protein when introduced into a susceptible plant.

BAWDEN (F. C.) & PIRIE (N. W.). **A note on some protein constituents of normal Tobacco and Tomato leaves.**—*Brit. J. exp. Path.*, xix, pp. 264–267, 1938.

In isolating a number of viruses from infected White Burley tobacco and Kondine Red tomato plants [cf. *R.A.M.*, xvii, pp. 564, 566, 619] the authors found that the proteins characteristic of the viruses isolated differed markedly from the proteins of normal plants and could be easily isolated; others, however, particularly those of the relatively unstable insect-transmitted viruses, such as potato virus Y, cucumber virus 1, and *Hyoscyamus* virus 3, had properties more closely resembling normal plant proteins, and their isolation presented a more difficult problem.

The molecules of some proteins from normal tobacco and tomato plants are large, being readily sedimented from neutral solution by high-speed centrifugation. The sedimented material gives brown jellies similar in appearance to those obtained by centrifuging crude virus preparations. The jellies are isotropic, and are readily dissolved or dispersed in water. These apparently homogeneous proteins with high molecular weights are probably normal constituents of many plant species, and their existence casts doubt on the purity of virus preparations made solely by high-speed centrifugation of infective sap. The authors found them in healthy and virus-infected tobacco and tomato plants; the materials centrifuged from cucumbers by Price and Wyckoff [ibid., xvii, p. 647] and from peas and beans by Loring, Osborn, and Wyckoff [ibid., xvii, p. 578] are, presumably, proteins of a similar nature. Wyckoff, Biscoe, and Stanley found no such proteins in tobacco and stated that healthy tobacco sap contains no molecules of greater weight than 30,000 [ibid., xvi, p. 415], but their treatment of the leaves before expressing the sap may account for this. As these normal plant proteins and the bushy stunt virus [ibid., xvii, p. 566] are denatured by freezing, it would seem that freezing the tissues may be a dangerous preliminary to investigations on the labile protein constituents of plants, though in isolating viruses unaffected by freezing and thawing the method may provide a useful fractionation.

Apart from high molecular weight these normal plant proteins bear little resemblance to the plant viruses so far isolated. All the viruses obtained by the authors in crystalline or liquid crystalline form have been nucleoproteins. The normal plant proteins differ from the viruses in being comparatively poor producers of antibodies when injected intravenously into rabbits. In discussing the suggestion that viruses might be portions of nuclear material or the naked nuclei of hypothetical small bacteria [ibid., xvii, p. 761], the authors point out that the nucleic acids characteristic of nuclei contain desoxypentose whereas all the plant viruses isolated contain a nucleic acid of the ribose type. The fact that there is no change in the total protein content

of infected leaves comparable with the change in the content of soluble protein [ibid., xvii, p. 630] suggests that infection changes the ratio of soluble to insoluble protein, and it is thought that a detailed study of the normal insoluble nucleoproteins of the cell might, perhaps, supply information on the mechanism by which the abnormal nucleoproteins are formed in the infected plants.

LAUFFER (M. A.) & STANLEY (W. M.). **Stream double refraction of virus proteins.**—*J. biol. Chem.*, cxxiii, 2, pp. 507–525, 1 fig., 2 diags., 1 graph, 1938.

Using an almost completely mechanized modification of Takahashi and Rawlins's method of measuring stream double refraction of flow [*R.A.M.*, xvi, p. 417], the writers observed this phenomenon in purified proteins isolated from tobacco plants infected by mosaic, aucuba mosaic of tomato, severe etch, tobacco ring spot, latent mosaic of potato, Holmes's masked tobacco mosaic, and a mild tobacco mosaic, but not in elementary bodies of vaccinia or the Shope rabbit papilloma virus protein. *Limulus* [*polyphemus*: see next abstract] and *Helix* haemocyanin, and hog thyroglobulin showed limited double refraction of flow when concentrated solutions were used.

The double refraction of flow in tobacco mosaic virus protein solutions [ibid., xvii, p. 563] appears to be attributable to the orientation of rods rather than to the photoelastic effect, since it occurs in solutions of relatively low viscosity and no direct correlation could be detected between change in viscosity and alteration in stream double refraction. Moreover, a time lag in the disappearance of double refraction was observed after the cessation of streaming, especially in systems near the isoelectric point. Double refraction was further found to persist after the passage of a stream of virus solution from a pipette into the air, thereby showing that the process is not directly dependent on shear, and hence that it is not due to the photoelastic effect.

Upon standing, relatively concentrated solutions of tobacco mosaic virus protein separated into two layers, of which the lower is spontaneously doubly refracting, confirming Bawden and Pirie's observations [ibid., xvii, p. 564].

SEASTONE (C. V.). **The measurement of surface films formed by hemocyanin, Tobacco mosaic virus, vaccinia, and Bacterium gallinarum.**—*J. gen. Physiol.*, xxi, 5, pp. 621–629, 3 graphs, 1938.

Using the Langmuir tray (*J. Amer. chem. Soc.*, xxxix, p. 1848, 1917) with certain minor modifications, the author measured the surface film areas formed by haemocyanin from *Limulus polyphemus*, ultracentrifuge-purified tobacco mosaic virus protein [see preceding abstract], vaccinia elementary bodies, and a suspension of *Bacterium gallinarum* (fowl typhoid), in comparison with pepsin and ovalbumin.

The following were the areas (in sq. m.) covered by 1 mg. spread of the different proteins or protein-containing particles on 90 per cent. saturated ammonium sulphate: pepsin 1·00, ovalbumin 1·07, haemocyanin 0·27, tobacco mosaic 0·06, vaccinia 0·13, and *Bact. gallinarum* 0·07. The tobacco mosaic virus was experimentally shown to remain on the surface of the solution notwithstanding the extremely small film

developed by this material. Data are presented from which it is tentatively concluded that the tobacco mosaic virus protein consists of a monolayer of vertically arranged rod-shaped molecules.

WYCKOFF (R. W. G.). **An ultracentrifugal analysis of the aucuba mosaic virus protein.**—*J. biol. Chem.*, cxxiv, 3, pp. 585–588, 1938.

The proteins of the aucuba and ordinary strains of the tobacco mosaic virus are similar but not identical in their ultracentrifugal behaviour [*R.A.M.*, xvii, pp. 207, 564], the former being more readily damaged by salts than the latter and remaining in an unaltered state only where quantity ultracentrifugation is carried out with distilled water as an intermediate solvent. Such a preparation gives the single sharp boundary indicative of one molecular species and has a sedimentation constant about 4 per cent. greater than that of the ordinary mosaic strain protein. The aucuba mosaic protein sediments rather more rapidly with $^{s}20° = 185 \times 10^{-13}$ cm. sec.$^{-1}$ dynes^{-1} than that of ordinary mosaic ($^{s}20° = 174 \times 10^{-13}$), the same being the case with the secondary boundary, $^{s}20°(2) = 220 \times 10^{-13}$, as compared with $^{s}20°(2) = 200 \times 10^{-13}$. The molecules of the two strains have nearly the same regions of P_H stability.

HOLMES (F. O.). **Inheritance of resistance to Tobacco-mosaic disease in Tobacco.**—*Phytopathology*, xxviii, 8, pp. 553–560, 1 fig., 1938.

This is an amplified account of work already noticed from other sources [*R.A.M.*, xvi, p. 417; xvii, p. 417].

GOLDIN (M. I.). Некоторые данные о кристаллических включениях при вирусе мозаики Табака. [Some data concerning crystalline inclusions in the mosaic virus disease of Tobacco.]—*Микробиол.* [*Microbiol.*], vii, 3, pp. 353–359, 1938. [English summary.]

In connexion with studies on the crystalline inclusions of mosaic-diseased tobacco at the Microbiological Institute of the U.S.S.R. Academy of Sciences, Moscow, the author detached from a tomato shoot, with the aid of a micromanipulator, groups of 15 to 20 hairs with and without Ivanovsky's crystals, and found that only the former were capable of infecting *Nicotiana glutinosa* leaves. Similar results were obtained by the same method with epidermal fragments of mosaic tobacco plants. These data are regarded as fully confirming Livingston and Duggar's observations as to the close connexion between the presence of inclusions and the concentration of the tobacco mosaic virus in the tissues of diseased plants [*R.A.M.*, xiv, p. 799]. Treatment of hairs with 0·1 N mercuric chloride resulted in the production of Stanley's crystals only in those hairs previously occupied by Ivanovsky's crystals [ibid., xvi, p. 569].

The alleged solubility of Ivanovsky's crystals was found to result solely from injury to the enveloping cells, e.g., by mechanical rupture or treatment with ether, chloroform, acids, or alkalis. Both Ivanovsky's and Stanley's crystals may be stabilized in the plant tissues with the help of picric acid or other reducing substances. Investigations on the masking of mosaic showed that plants in which the symptoms of the disease are suppressed contain larger amounts both of the virus and

of Ivanovsky's crystals, the detection of which may be utilized for diagnostic purposes.

GUMAER (W.). **Control of blue mould of Tobacco with benzene vapour.**—*Industr. Engng Chem.*, xxx, 9, pp. 1076–1081, 4 figs., 3 diags., 5 graphs, 1938.

From recent observations in Connecticut the writer concludes that the evaporation ratio (area of evaporation surface to area of plant bed) is a poor indication of the benzene vapour concentration in a tobacco plant bed. The percentage of benzene vapour in the atmosphere of a plant bed is an accurate measure of the efficacy of benzene treatment of blue mould (*Peronospora tabacina*) [*R.A.M.*, xvii, p. 845], irrespective of weather conditions and gas-tightness of the bed. All fresh sporulation is arrested in two nights with a vapour concentration of 0·05 per cent. throughout the night. A special Mine Safety Appliance combustible gas indicator, calibrated for benzene, has been found satisfactory for measuring benzene in tobacco plant beds. Wetting cloth covers at sunset greatly increases the vapour concentration, which can then be maintained at the desired strength until morning, except with very light cloth (42×44 mesh), even on dewless nights. Washing new cloth to increase its wettability more than doubles the vapour concentration. Unbleached sheeting, 56×60, is recommended as the cheapest standard cloth retaining sufficient vapour in the bed while permitting the penetration of night rains through the cover. Tightness of the cover is more important than the distance between evaporators and the evaporation ratio. With tight covers benzene evaporators may be placed 12 to 15 ft. apart. Washed and wetted, 56×60 mesh cloth is more gas-tight than glass sash, though the latter shows increased efficacy when wet owing to the infiltration of water into the cracks between overlapping panes. A wick evaporator has been developed giving a more uniform vapour distribution in the plant bed and a higher vapour concentration on cold nights, besides avoiding plant damage from excessive vapour on hot nights and from spilling benzene, and presenting various other advantages. All symptoms of blue mould were prevented by the use of the contrivance for 20 sq. yds. of plant bed, the benzene consumption being 10 c.c. per sq. yd.

ALLAN (J. M.), HILL (A. V.), & ANGELL (H. R.). **Downy mildew (blue mould) of Tobacco: its control by benzol and other vapours in covered seed-beds. IV.**—*J. Coun. sci. industr. Res. Aust.*, xi, 3, pp. 247–253, 1938.

In further experiments for the control of downy mildew of tobacco (*Peronospora tabacina*) [see preceding abstract] the best results were again obtained with benzol, which was equally effective when evaporated from troughs or from cans, the effect being greater when many centres of evaporation were used. An evaporation surface ratio of 1 to 100 was sufficient under average conditions but one of 1 to 72 may be necessary when the conditions are very favourable to the disease. The use of benzol on alternate nights has proved satisfactory in two seasons' experiments but further work is required to determine whether this procedure may safely be adopted. Calico seed-bed covers treated

with cuprammonium (5 per cent. copper sulphate in water+strong ammonia to dissolve the precipitate) did not show fungal contamination, while covers treated with shirlan or kharki (chrome alum ½ lb., ferrous sulphate ½ lb., pyrolignite of iron ½ lb., water 2 gals., followed by treatment with sodium silicate 1½ lb. in 2 gals. water) were slightly affected.

Atkinson (H. J.) & Robinson (C. H.). **Soil studies of brown root rot of Tobacco. I. Effect of certain crop residues on some forms of nitrogen.**—*Sci. Agric.*, xviii, 12, pp. 685–694, 1938.

After briefly reviewing earlier investigations into tobacco brown root rot [*R.A.M.*, xvii, p. 774] and referring to Beaumont's hypothesis that the disease results from the presence of unoxidized forms of nitrogen in the soil, due to the decomposition of plant residues, which set up conditions in the roots that induce attack by decay organisms [ibid., xvi, p. 67], the authors give a fully tabulated account of laboratory experiments in which soil samples were treated with the ground-up stubble and roots of maize, timothy [*Phleum pratense*], oats, and lucerne and analyses made at intervals for ammonia, nitrite-nitrogen, and nitrate-nitrogen. The soils were maintained at about 60 per cent. of their water-holding capacity, and two series were kept at room temperature (20° to 25° C.) and the third at about 10°.

The results obtained showed that the addition of the plant residues did not cause any appreciable accumulation of ammonia or nitrites in the soil, except in the case of lucerne stubble, which, however, also gave a large accumulation of nitrate-nitrogen. All residues depressed the initial accumulation of nitrates, but the effect of lucerne lasted only a short time, that of maize was less lasting than that of timothy, and oats caused the most prolonged effect of all.

Brown root rot has been reported to be favoured by a low temperature but incubation of the soil samples at 10° did not cause any accumulation of ammonia or nitrites and nitrates accumulated possibly rather more slowly than usual. The authors conclude that residues of maize and timothy (both crops liable to predispose a subsequent tobacco crop to brown root rot) exert no more pronounced effect on the three forms of nitrogen studied than do oat residues.

Reid (W. D.). **Bacterial-canker of Tomatoes.**—*N.Z. J. Sci. Tech.*, A, xx, 2, pp. 69–74, 3 figs., 1938.

A brief account is given of the symptoms of bacterial canker of tomatoes (*Aplanobacter michiganense*), first observed in Auckland, New Zealand, in 1936, together with a technical diagnosis of the causal organism, which agrees in all essential features with earlier descriptions [*R.A.M.*, x, p. 415], and recommendations for control, based on overseas experience.

Lesley (J. W.) & Wallace (J. M.). **Acquired tolerance to curly top in the Tomato.**—*Phytopathology*, xxviii, 8, pp. 548–553, 1 fig., 1938.

When young tomato plants growing in the field are inoculated in late spring with the virus of [beet] curly top [*R.A.M.*, xv, p. 123], in about 12 days the leaves become rolled, the plant turns sulphur-yellow, growth is checked, the flowers and buds drop, and the fruit colours

prematurely. Plants that have already matured fruit, and those raised from cuttings of more mature plants are less readily infected. Affected plants generally succumb, but in some cases a partial 'recovery' appears to take place, i.e., a process of regeneration in which relatively healthy shoots arise from the leaf axils. New, apparently healthy shoots sometimes arise from the lower nodes of severely diseased plants after almost all the top growth has died. If recovery occurs early enough in the season, and if the growth of the regenerated parts is more or less normal, the plant may yield mature fruit. The new growth, especially at first, may be feeble and yellowish, or it may be fairly healthy, with a slight yellow and purple tinge. A relapse may occur, and the plant die.

Recovery by regeneration appears to be influenced by weather conditions and the stage of growth of the plants when the symptoms develop, but it is also a racial characteristic. In a wild race from western Mexico, Guasave A, from 55 to 100 per cent. of the plants recovered in different years. Clones from plants that have recovered by regeneration appear to show a resistance or tolerance not present in clones from disease-free, uninoculated plants.

Full details are given of experiments during the years 1934 to 1937 in which inoculation of recovered plants failed to produce severe symptoms, and the evidence obtained indicated that the presence of the virus in regenerated plants is a prerequisite for acquired tolerance. Plants of a recovered clone grow slowly and show mild curly top symptoms characteristic of regenerated shoots, but may be fairly productive.

DUFRÉNOY (J.). **Le 'spotted-wilt'.** [Spotted wilt.]—*Ann. Épiphyt.*, N.S., iii, 2, pp. 187–223, 21 figs., 3 graphs, 1937. [Received October, 1938.]

In this detailed account of his studies on tomato spotted wilt in south-western France [*R.A.M.*, xvi, p. 284] the author emphasizes the wide host range of the virus, and describes the symptoms it produces on a number of ornamental plants, which constitute a menace to tobacco and tomato crops in their vicinity by acting as reservoirs of infection. In an inoculation experiment performed by rubbing the 13th leaf of a healthy tobacco plant with infective juice (from a tobacco plant showing chlorotic rings and growing near some plants of *Callistephus sinensis* [*C. chinensis*] affected with spotted wilt), the following series of symptoms developed: annular spots on the 12th leaf, mosaic on the 11th and 9th leaves, and an 'oak leaf' pattern on the 8th and 7th leaves, the younger leaves remaining healthy in appearance. In a similar experiment, using juice from an infected plant of *Physalis francheti*, the symptoms also included primary dark brown lesions along the veins of the leaves, crinkling of the leaf blades, and cankers on the mid-ribs and stems. Secondary shoots developing in the axils of the leaves became necrosed at the base, and their leaves developed the 'oak leaf' pattern.

The cytological changes accompanying these symptoms are fully described, the main features being the formation of suberized layers in the tissues adjacent to the veins, and the progressive series of changes

in the palisade and mesophyll cells accompanying the development of chlorosis and necrosis. These changes are interpreted as being due to oxidation processes culminating in the precipitation of phenolic compounds, and are intensified in plants receiving potassium and phosphoric fertilizers, and exposed to sunlight. In plants receiving nitrogen the necrotic symptoms do not develop, and the virus tends to become systemic.

In the concluding sections of the paper the serological and immunological reactions of the virus, its physical properties and inactivation, and the phenomenon of acquired immunity in tobacco are summarized and discussed.

Berger (G.). **Une maladie de la Tomate : la nécrose du collet due à l'Alternaria solani Sorauer dans la région de Casablanca et de Fédala (Maroc).** [A disease of Tomato: collar necrosis due to *Alternaria solani* Sorauer in the region of Casablanca and Fédala (Morocco).]—*Ann. Épiphyt.*, N.S., iii, 2, pp. 225–230, 1 fig., 1937. [Received October, 1938.]

For several years past serious losses have been caused in the vicinity of Casablanca and Fédala, Morocco, by the collar rot phase of tomato early blight (*Alternaria solani*) [*R.A.M.*, vii, p. 411; xiii, p. 195; xv, p. 633; xvii, p. 778]. Infection is most prevalent in autumn sowings in nurseries.

The disease develops as soon as the plants appear above the soil, but becomes readily noticeable only on seedlings that are a few weeks old. Livid brown, later greyish, oval, sunken, often zonate lesions appear on the stem at or above the collar, and frequently result in girdling. Only the cortical tissues are affected, at any rate at first, and the young plants appear to show normal growth. As the necrosis spreads round the stem and upwards, the plants turn yellow, lose their foliage from the base upwards, and wilt. The stem may break off. Most of the plants affected while very young may live on in the nursery, growing slowly. If attacked at a later stage, they may fruit. If planted out deeply, such plants may develop new roots above the affected collar, but as a rule the plant turns yellow and dries up before the new roots have had time to form.

Infection occurs at, or above, but never below, soil-level. Infection at soil-level is probably due to mycelium on the soil surface, derived from diseased plant debris or spores from other plants in the vicinity. Definite evidence was obtained that the germ-tube can penetrate the intact or bruised epidermis of the host. The fungus becomes localized in the cortical layers, which, in plants surviving attack, dry up and flake off.

Under the local conditions, infection is favoured by the warm winters, and high atmospheric and soil humidity. Previous soil infection undoubtedly plays a large part.

Disinfection of soil, which had previously borne diseased tomatoes, with 2 per cent. formalin gave complete control, as against 15 and 30 per cent. infection in two control plots at the time of transplanting, and greatly increased the vigour of the seedlings, but the advantage of this form of control is much reduced by the likelihood of subsequent

infection. Dusting or spraying the plants as soon as they appear above the soil with some suitable fungicide would appear to offer the best protection.

CARTER (J. C.). **Verticillium wilt of woody plants in Illinois.**—*Plant Dis. Reptr*, xxii, 12, pp. 253–254, 1938. [Mimeographed.]

Among the 12 species of woody plants found to be infected by *Verticillium albo-atrum* in Illinois from 1931 to 1937, inclusive, are almond, elm, five species of *Acer*, *Catalpa speciosa*, and *Robinia pseudacacia*, the two last-named being new host records for the fungus.

KONING (HENRIETTE C.). **The bacterial canker of Poplars.**—*Meded. phytopath. Lab. Scholten*, xiv, pp. 3–42, 2 pl., 8 figs., 1938.

This is an expanded account of the author's study on the bacterial canker of poplar attributed to *Pseudomonas rimaefaciens* n. sp. [*R.A.M.*, xvii, p. 492]. In addition to the symptoms already noted, it is stated that the slime exuded from cracks and lenticels dries and hardens into a shiny layer in dry weather. Young branches are killed by the disease and cankers on older branches thicken and develop callus so that a very irregular crumbly structure is produced. Growth is renewed in subsequent years, the greatest development taking place in the spring and early summer. The bacteria spread in narrow lines in the wood or bark, and these in cross section appear as red points. Such lines may extend long distances beyond the cankered area, and cause fresh cankers to develop. Inoculations with bacterial suspensions gave positive results, and bacteria re-isolated from the branches above and below the place of inoculation, when re-inoculated, caused a canker. Artificial infection is difficult or impossible in December, January, and February.

The bacterium is described as a short motile rod with 1 to 3 polar flagella, single or in pairs, Gram-negative, non-acid-fast, and non-sporing. It is aerobic, rapidly liquefies gelatine, and peptonizes milk. It grows abundantly on beer wort agar and peptone-glucose-saccharose agar, producing a cream-coloured, filiform streak with lobate edge and sometimes beaded; the minimum, optimum, and maximum temperatures for growth are below 14°, 25° and between 30° and 37° C., respectively, and the thermal death point lies between 42° and 48°. The bacterium does not produce hydrogen sulphide; forms a small amount of indol; does not hydrolyse starch; never produces gas; forms acid in the presence of sugars; utilizes nitrogen from peptone, asparagin, urea, gelatine, glycine, nitrates, and ammonium salts, but not from casein, albumin, or leucine; does not reduce nitrates except in solutions of 0·1 per cent. potassium nitrate with 0·04 per cent. dipotassium hydrogen phosphate or 0·02 per cent. magnesium sulphate, and with either 0·4 per cent. sodium succinate or 0·4 per cent. calcium malate as the carbon source. It utilizes carbon from glucose, saccharose, glycerol, succinates, malates, citrates, and oxalates, but not from the higher carbohydrates. The colonies are round, convex, smooth, somewhat granular, with a hyaline edge.

The varieties *Populus brabantica* Houtzagers, *P. trichocarpa* Torrey & Gray, and *P. candicans* Ait. proved to be very susceptible. In

comparative studies on the fungus canker of the poplar, which is stated to be easily distinguishable from the bacterial canker by the regular callus round the wound, it was found that *Nectria coccinea* [cf. ibid., xiv, p. 478] was most frequently present, but *N. galligena* [ibid., xvii, p. 492] and *Botryodiplodia penzigii* also occur. Inoculations through wounds with both species of *Nectria* were successful, the strongest infection occurring in those made during September to November whilst January to March inoculations also gave good results but those performed in May to August were negative. Inoculations with *B. penzigii* resulted in symptoms similar to those of the *Nectria* species but the wood showed a blackish-purple discoloration.

On black Italian (*Populus nigra italica*) and balsam poplars bacterial infection is nearly always followed by *Nectria* and other fungi, and this explains why *Nectria* has been considered to be the chief cause of the disease in Holland. The slime exudations characteristic of bacterial canker are only visible during a short time of the year in rainy weather. In France the author found the bacterial cankers almost free from fungi, and the slime clots were found on poplars of the balsam group. Similar slime clots were observed on material of *P. eugenei* from England.

Régnier (R.). **Contribution à l'étude des Peupliers et de leurs principaux ennemis. Origine et classification des Peupliers.** [A contribution to the study of Poplars and their chief enemies. The origin and classification of Poplars.]—*Ann. Épiphyt.*, N.S., iii, 4, pp. 507–549, 20 figs., 1937. [Received October, 1938.]

Following a detailed study of the classification of the poplars, the author in the concluding section of this paper discusses the reaction of various species and hybrids to the canker disease as it occurs in the Seine-et-Marne [*R.A.M.*, x, p. 567], referred to provisionally as 'pernicious canker', to distinguish it from the condition attributed to *Nectria galligena* in Holland and Belgium [see preceding abstract]. In recent studies at the Station Centrale de Pathologie végétale Lansade is stated to have isolated several organisms belonging to *Phomopsis* and *Nectria*, as well as bacteria, from the cankers, which may, it is thought, be due to an association of fungi and bacteria [ibid., xiii, p. 408].

Observations in a nursery showed that hybrids of the black poplars of the first and second degree are hardly, if at all, susceptible, whereas those of the third degree and most of the species of the '*tacamahacca* group' are seriously affected. The tertiary hybrids, which are the most susceptible, are usually male, while most of the female hybrids are resistant. Among the black poplars a hybrid that should be eliminated is the Caroline poplar of the Oise valley (× *P. eugenei*) [loc. cit.], while the male hybrid × *P. brabantica* is also susceptible. Smooth-barked, male trees of the type known as 'Régénéré blanc de l'Ourcq' are somewhat susceptible. 'Sarcé blanc' (thought to be a tertiary hybrid) appears to be resistant. The female regenerated trees belonging to × *P. regenerata* Henry are seldom dangerously attacked. The remaining species, varieties, and hybrids of black poplar seem, so far, to be resistant. Among white poplars, only *P. alba* var. *bolleana* appears to be susceptible. With proper selection and careful cultural practices

the author considers it should now be possible to develop resistant plantations.

HOPP (H.). **The formation of colored zones by wood-destroying fungi in culture.**—*Phytopathology*, xxviii, 9, pp. 601–620, 2 figs., 3 diags., 1938.

The microscopic study of the discoloured zones (defined as unnaturally coloured regions associated with a pathological factor) occurring in association with the decay of poplar (*Populus canadensis* var. *eugenei*) wood blocks in specially constructed humidity chambers [*R.A.M.*, xvi, p. 112] under strictly controlled conditions showed the phenomenon to be due to a vital process of the hyaline type of vegetative hyphae of the five fungi concerned, viz., *Fomes applanatus* [*Ganoderma applanatum*: ibid., xvii, p. 713; and above, p. 2], *F. fomentarius* [ibid., xvi, p. 645], *F. fraxinophilus*, *Polyporus hispidus* [ibid., xvii, p. 83], and *F. igniarius* [ibid., xvii, p. 358]. The zones consisted essentially of swollen, gnarled hyphae, associated with a brown pigment secreted by the mycelium. Coloration of the hyaline type of mycelium was induced by exposure of the hyphae to a current of air saturated with water, though the reaction was not one of oxidation. Within the wood such conditions obtained only in restricted layers, accounting for the development of pigmentation in discoloured zones or dark lines. A similar but more extensive type of coloration occurred in mycelium growing on agar surfaces and moist wood. An indirect influence on the process of coloration was exerted by the physical structure of the substratum and the relative humidity of the air. It is concluded from these studies that the coloration of the mycelium induces the discoloration of the wood, while the presence of zone lines (=black lines) of decay in the substratum is explained by the restriction of pigmentation. The term 'coloured zone' is proposed in place of 'pseudosclerotium' as used by Campbell [ibid., xvi, p. 137].

WILKINS (W. H.). **Studies in the genus Ustulina with special reference to parasitism. III. Spores—germination and infection.**—*Trans. Brit. mycol. Soc.*, xxii, 1–2, pp. 47–93, 1 fig., 13 graphs, 1938.

Spores of *Ustulina vulgaris* [see above, p. 1] collected from beech trees during a period of six months in each of three successive seasons were calculated, from an average of 518 spores, to measure $30{\cdot}82 \pm 0{\cdot}11$ by $7{\cdot}47 \pm 0{\cdot}03\ \mu$. The germinative capacity of the spores appeared to be very dependent on the age of the spores, being at its maximum with young mature spores and decreasing with age. Spores exuded in August and early September were mostly immature, but at the beginning of October the majority were mature. Viability persisted for about six months from October to March. The temperature for germination ranged from 10° to 35° C. with an optimum at 25 to 30°; the spores withstood 0°, but were killed very quickly at 45°. An analysis of outdoor temperatures in Oxford seemed to indicate the improbability of infection by spores, since, except for October, the temperatures during the sporing season usually approximate to or fall below the lower limit for germination (10° C.). Both in nature and in the laboratory a damp atmosphere was necessary for the emergence of spores from the

perithecia, and spores germinated only in water. Of several nutrient media tested, Leonian's secured maximum germination and each of its constituents tested separately also gave good results. The optimum hydrogen-ion concentration of the media for germination was found to be P_H 6, and the acid limit about P_H 2·5; the alkaline limit could not be determined but appeared to be beyond P_H 9.

Infection studies with seven different kinds of wood showed that spores of *U. vulgaris* could germinate on and penetrate both living and dead beech and lime wood; to a less degree elm, poplar, ash, and horse chestnut, but not oak. Infection by spores appears to be possible but not very probable in temperate climates, and it is suggested that the relative infrequency of the disease in these regions may be due to the temperature factor. The conidial stage also may play a role in infection, but this has not yet been investigated.

Steinmetz (F. H.) & Prince (A. E.). **Observations on Willow blight in Maine, 1927 to 1938.**—*Plant Dis. Reptr*, xxii, 14, pp. 282–283, 1938. [Mimeographed.]

Observations in Maine from 1934 to 1938, inclusive, indicated that willow blight (*Fusicladium saliciperdum*) [*Venturia chlorospora*: *R.A.M.*, xvi, p. 590] is favoured by cool, wet weather, and suppressed by hot, dry conditions. Numerous trees in one heavily infected area were unaffected, relatively large stands of this type occurring along the Kennebec river at Waterville and Augusta. The susceptible type is considered to be *Salix alba* var. *vitellina*, while the resistant type is *S. fragilis*. Susceptible types, however, have also been identified as *S. fragilis*. Trees of the resistant type fit the general description of *S. fragilis*; they are staminate, and may belong to a single clone. Field observations show that this type and *S. pentandra* have survived in a vigorous condition in localities where susceptible types have succumbed.

Petri (L.). **Il mal dell' inchiostro del Castagno.** [Ink disease of the Chestnut.]—*Ital. agric.*, lxxv, 8, pp. 527–532, 1938.

A semi-popular account is given of the ink disease of chestnuts (*Phytophthora cambivora*) and its control in Italy [see above, p. 1], with special reference to the extended cultivation of the Tamba variety of Japanese chestnut (*Castanea crenata*), both the fruit and wood of which are comparable in quantity and quality to the indigenous products.

Elm disease eradication in the United States.—*Chron. bot.*, iv, 4–5, pp. 429–432, 1938.

In this review of the campaign carried out in the United States against Dutch elm disease (*Graphium* [*Ceratostomella*] *ulmi*) [*R.A.M.*, xvii, p. 568] it is stated that up to 14th May, 1938, the number of dead and dying trees removed since the inception of the campaign in 1933 amounted to 2,630,893, and out of 218,798 suspects collected 28,407 were confirmed. It has been ascertained that *C. ulmi* may be present for several years without any visible sign of its presence, and trees with such hidden infection may transmit the disease to others by the agency

of insects. Thus, present methods of scouting, depending on observations of wilting, dying, or discoloured foliage, do not reveal every case of infection. It has further been shown that the disease can live and grow in dead elms for a period not yet determined.

BURGER (F. W.). **Iepensterfte in Nederland.** [Dying-off of Elms in the Netherlands.]—*Tijdschr. PlZiekt.*, xliv, 4, pp. 177–207, 2 pl., 2 diags., 1 map, 1938.

Tables are presented showing the comparative mortality from Dutch elm disease [*Ceratostomella ulmi*] in different years (extending back to 1920 in certain instances) in various parts of Holland [*R.A.M.*, xvii, p. 780], accompanied by a general discussion of the present situation and future possibilities of control. Whilst the present measures are helping to arrest the spread of the disease, the outlook for the future is not considered to be very promising, and a more intensive control campaign is advocated.

JENKINS (ANNA E.). **Emendations to the descriptions of Taphrina lethifera and T. aceris on Maple (Acer).**—*J. Wash. Acad. Sci.*, xxviii, 8, pp. 350–352, 2 figs., 1938.

Emended descriptions are given of *Taphrina lethifera* (Peck) Sacc. and *T. aceris* (Dearn. & Barth.) Mix, the only two species of *Taphrina* recorded on maples (*Acer*) in the United States [*R.A.M.*, iv, p. 527]. In addition to certain subsidiary characters omitted from the original descriptions of the two species, each possesses a stalk cell of which no mention had been made.

JENKINS (ANNA E.). **A new species of Taphrina on Sugar Maple and Black Maple.**—*J. Wash. Acad. Sci.*, xxviii, 8, pp. 353–358, 3 figs., 1938.

English and Latin diagnoses are given of *Taphrina sacchari* n.sp., the agent of a destructive leaf blight of black and sugar maples (*Acer nigrum* and *A. saccharum*), both species being attacked in Ohio and the latter also in twelve other States. The fungus is characterized by hypophyllous, cylindrical to clavate, rounded or truncate asci, 16 to 24 (sometimes 28) by 6·7 to 10 μ, with a variable stalk cell, 5 to 10 μ in height by 10 to 16 μ in width, and eight subglobose to elliptical ascospores, 6 to 7 by 4 to 5 μ. It is considered to be closely related to *T. acericola* [*R.A.M.*, iv, p. 527], known only on *A. campestre* from Italy. The lesions formed by *T. sacchari* on the leaves of its hosts are scattered, sometimes confluent, deciduous, up to 1·5 cm. in diameter, circular, subcircular, or irregular, pinkish-buff below and ochraceous-tawny above, with variations of cinnamon-buff, snuff-brown, clove-brown, bistre, or blackish-brown (Ridgway). The foliar spotting may be accompanied by an upward rolling of the lobes.

BORZINI (G.). **Osservazioni su di un seccume del Carpino nero (Ostrya carpinifolia Scop.).** [Observations on a wilt of Hop Hornbeam (*Ostrya carpinifolia Scop.*).]—*Boll. Staz. Pat. veg. Roma*, N.S., xviii, 1, pp. 131–145, 3 figs., 1938.

A serious wilt disease of *Ostrya carpinifolia* in Teramo, Italy, in 1937

is attributed by the author to *Valsa decorticans* Fr., the pycnidial form of which, *Cytospora decorticans* Sacc., was also present. Infection was promoted by the effect on the host of unfavourable soil and weather conditions.

ROTHBERG (M.). **A cultural study of Fistulina hepatica (Huds.) Fries, isolated from decayed Jarrah (Eucalyptus marginata, Sm.).**—*Proc. roy. Soc. Vict.*, N.S., l, 1, pp. 157–169, 2 pl., 2 figs., 1938.

Fistulina hepatica has been isolated (10 times in all) from the following types of jarrah (*Eucalyptus marginata*) rots in Western Australia [*R.A.M.*, xvii, p. 148]; heart or dry rot, pith or 'doze', straw rot, decayed included sap, yellow-edged pin-holes, and pencilled wood. In the writer's studies the fungus was grown in pure culture on 2·7 per cent. malt agar, the cultures being incubated for three to four weeks at 18° to 22° C. in subdued light at a relative humidity of 60 to 70 per cent., and some used as a substratum for inoculating sound blocks of jarrah. The colonies formed by the jarrah strain of *F. hepatica* are cartridge-buff to ochraceous-orange, later ochraceous-tawny to russet, instead of pinkish-cinnamon to straw-yellow, turning pale vinaceous-brown or russet, as in the oak strain described by Cartwright and Findlay [ibid., xvi, p. 4]. Other cultural differences include the occasional production by the *Eucalyptus* strain of typical fruit bodies (absent from the oak strain), as well as by others designated *Ceriomyces*-type, *Solenia*-type, *Cyphella*-type, and near-typical, the frequent formation of clamp-connexions and chlamydospores (scanty in the oak strain), and the absence of conidia (occurring in profusion in the isolations from 'brown oak'). The author considers that *F. hepatica* is the cause of the heart rot of jarrah, and experiments are in progress to ascertain its decay-inducing properties.

BUCHANAN (T. S.). **Annual growth rate of Cronartium ribicola cankers on branches of Pinus monticola in northern Idaho.**—*Phytopathology*, xxviii, 9, pp. 634–641, 1 graph, 1938.

An investigation conducted from 1933 to 1937 on the annual proximal growth increments of western white pine (*Pinus monticola*) blister rust (*Cronartium ribicola*) [see above, p. 3] branch cankers within the commercial range of the tree in northern Idaho yielded a total of 476 measurements from 15 series of calculations on 103 trees in six localities. All diameter classes between 0·01 to 0·10 and 1·11 to 1·20 in. were represented.

The graph depicting canker growth on branches of various sizes shows a straight-line trend, increments ranging from 1·26 in. on branches 0·10 in. in diameter to 2·49 in. on those measuring 1·20 in. 'Flagging' (cankers causing death of the foliage out to the tip of the distally supporting branch) and age of the cankers exerted no significant effect on proximal growth, though a tendency to increased growth rate accompanying advancing age of the cankers is suggested. The data herein presented are regarded as directly applicable to studies of blister rust damage on western white pines up to at least 30 ft. in height.

Mirov (N. T.). **Vegetative propagation of White Pine as a possible method of blister rust control.**—*J. For.*, xxxvi, 8, p. 807, 1938.

A brief note is given on the possibilities of the vegetative method of propagation of white pine (*Pinus strobus*) as a means of developing a strain immune from blister rust [*Cronartium ribicola*: see preceding and next abstracts]. Preliminary tests in California with 3- or 4-in. long branches from 10-year-old trees rooted in coarse sand have proved the physiological feasibility of the process, which is considered to afford some promise of eliminating the undesirable tendencies to rust susceptibility commonly inherent in the progeny of trees multiplied by sexual reproduction.

Klebahn (H.). **Offene Fragen und neue Beobachtungen über die rindebewohnenden Blasenroste der Kiefern.** [Open questions and new observations on the bark-inhabiting blister rusts of Pines.]—*Z. PflKrankh.*, xlviii, 8, pp. 369–410, 10 figs., 1938.

The author summarizes and discusses the present status of knowledge on the blister rusts of pines. The three best-known European rusts are: *Peridermium cornui* (*Cronartium asclepiadeum*) [*R.A.M.*, xvii, p. 281], the latter name being, in the opinion of the author, preferable to *C. flaccidum* because of the inadequacy of the early diagnosis of this species, which antedates *C. asclepiadeum* by only a few months; the autoecious *P. pini* [ibid., xvii, p. 214]; *P. strobi* (*C. ribicola*), *P. pini* f. *montanae* and several other European rusts seem to be of doubtful validity, whereas *C. gentianeum* on *Gentiana asclepiadea* may prove to have an unrecorded aecidial stage on pine. *Uredo quercus* [ibid., xvi, p. 207], found in Europe, is not considered to be synonymous with the American rust *P. cerebrum* [ibid., xii, p. 68], since neither teleutospores nor the *Peridermium* stage have so far been found in Europe. Asiatic rusts include *P. cerebrum* with its teleuto stage *C. quercuum* [ibid., xv, p. 63], *P. kurilense* [ibid., vii, p. 207], *P. indicum* [ibid., xvi, p. 146], and *P. himalayense* [ibid., xiii, p. 340]. Pine blister rusts occurring in America, according to Arthur, are *P. strobi* (*C. ribicola*), *P.* sp. (*C. comptoniae*) [ibid., xvii, p. 360], *P. cerebrum* (*C. quercuum*), *P.* sp. (*C. occidentale*) [ibid., xvii, p. 150], *P.* sp. (*C. comandrae*), and *P. harknessii* (*C. coleosporioides*) [ibid., v, p. 264]. Some less thoroughly studied American rusts are *P. weirii*, *P. guatemalense*, and the Woodgate *Peridermium* [ibid., xvii, p. 572].

In the concluding sections the author discusses the forms of development exhibited by these rusts, viz., strict and facultative heteroecism and autoecism, and describes observations on the nuclear behaviour of *P. cornui* (*C. asclepiadeum*) and *P. pini*. Contrary to general observations, the author has repeatedly succeeded in finding spermogonia of *P. pini*.

Haddow (W. R.). **On the classification, nomenclature, hosts and geographical range of Trametes pini (Thore) Fries.**—*Trans. Brit. mycol. Soc.*, xxii, 1–2, pp. 182–193, 1938.

The author gives a list of 20 synonyms of *Trametes pini* (Thore) Fries, including *Fomes pini* Karsten (1882), a nomenclatorial combination wrongly credited to Lloyd (1915) [*R.A.M.*, xiv, p. 66; xv, p. 694;

xvi, p. 848]. An outline of the history of the nomenclature of the species is followed by a list of specimens studied in several herbaria. The world distribution of the fungus on its wide range of coniferous hosts is discussed in some detail, whence it appears that the fungus is generally distributed throughout the coniferous regions of the northern hemisphere, but has not been reported (apart from one record of questionable authenticity) in the southern hemisphere.

Blokhuis (J. L. W.). **Bastbeschadigingen aan Japanschen Lariks en Eik.** [Cortical injuries on Japanese Larch and Oak.]—*Ned. Boschb.-Tijdschr.*, xi, 8, pp. 352–354, 1 fig., 1938.

In connexion with the detection of *Fomes annosus* in a ten-year-old Japanese larch [*R.A.M.*, xvi, p. 358] stand in Holland, the writer draws attention to the extreme delicacy of the cortex of this species and its liability to injury through such environmental conditions as extremes of temperature (alternating strong sunshine and severe night frosts in the case in point), the actual damage from the fungus being secondary. Many instances of suspected canker [*Dasyscypha willkommii*: see next abstract] are believed to be attributable to careless handling. Larches should never be planted on old agricultural land, where extensive root rot is apt to occur (40 per cent. in a 13-year-old stand in one locality under observation).

A brief note is given on frost canker in oaks.

Rădulescu (A.). **Apariția cancerului Laricei in România.** [The appearance of Larch canker in Rumania.]—*Rev. Padurilor*, I, 7–8, pp. 661–666, 3 figs., 1 map, 1938. [French summary.]

Larch canker (*Peziza*) [*Dasyscypha*] *willkommii* [*R.A.M.*, xvii, p. 640, and preceding abstract] was first observed in 1934 affecting some 60 per cent. of the 25- to 40-year-old stands in the Prahova Valley. In agreement with Münch, the writer ascribes the development of the disease to the use of seed of unsuitable origin, the material for the plantings under observations (1,050 m. above sea-level) having been procured from a disproportionately high elevation (1,600 m.) in the Tyrol.

Callen (E. O.). **Some fungi on the Yew.**—*Trans. Brit. mycol. Soc.*, xxii, 1–2, pp. 94–106, 1 pl., 3 figs., 1938.

The several fungi discussed in this paper were obtained from leaves of yew trees (*Taxus baccata*) near Edinburgh and studied in pure culture. *Sphaerulina taxi* grew more rapidly at first on yew extract agar than on malt agar, and if no fructifications were produced the mycelium covered the Petri dish in four weeks, whereas when these were developed the colony might be as little as $\frac{3}{10}$ in. in diameter in the same period. Concentric brown rings were formed in the medium and plentiful conidia were produced, especially on malt agar, budded off from any part of the mycelium. Mono-ascospore isolations yielded pycnidia identified as *Cytospora taxifolia* (Cke & Mass.) em. Pilát & Macal, though the author in adopting this name points out that the specimen labelled *C. taxifoliae* by Cooke in 1890 is not from *T. baccata* but from *Abies* and is identified as *C. friesii* Sacc. (1884), the pycnidial form of *Valsa*

friesii. The synonymy and a revised English diagnosis of *S. taxi* are given; the asci measure 57 to 75 by 10 to 13·5 μ and the spores (first uni-septate, later tri-, or in rare cases quinqueseptate) 20 to 37·5 by 6·5 to 9 μ (average 28 by 7·5 μ).

The fungus is stated to be widespread in Scotland, where it causes much damage to yew trees, particularly the golden varieties, in the course of a year or two. The spores infect the leaves of the new shoots in spring, but outward signs of infection appear only in early autumn. The stem may become ringed and the shoot die when several leaves close together are infected. Dead leaves remain on the shoot for at least six months, unless the tree is exposed to winds.

Material of *Physalospora gregaria* var. *foliorum* Sacc., the ascigerous stage of *Phyllostictina hysterella* (syn. *Phoma hysterella* Sacc. [*R.A.M.*, v, p. 198]), was collected in November, 1934. The ascospores grew slowly on yew extract agar forming a whitish-grey, later steel-grey, mycelium, with concentric zones of pycnidia. A revised English diagnosis is given of both stages. The club-shaped, eight-spored asci of *Physalospora gregaria* var. *foliorum* measure 52 to 90 by 13 to 25 μ, and the hyaline, unicellular, ovate-oblong to egg-shaped spores 15 to 23 by 7 to 12 μ; the spores of *Phyllostictina hysterella* are unicellular, hyaline, coarsely granular, 10 to 16 by 8 to 10 μ, and the straight, cylindrical sporophores 6·5 to 11 by 2·5 μ. The mycelium spreads through the stem and twigs of the yew trees, but if the lower part of the branch is killed the fungus does not spread into the upper part. The distribution of the fungus in Scotland appears to be limited. Other fungi recorded include *Gloeosporium taxi* and *Cryptocline taxicola* (syn. *G. taxicola*) [loc. cit.], the latter an obvious saprophyte.

Rohde [T.]. **Bedeutung der Schweizer Douglasienschütte für den Douglasienanbau.** [The importance of the Swiss needle-fall of Douglas Firs in Douglas Fir cultivation.]—*Z. PflKrankh.*, xlviii, 8, pp. 424–425, 1938.

This is a German version of the conclusions reached by the author and others on the needle-fall disease [*Phaeocryptopus gaeumanni*] of Douglas fir [*Pseudotsuga taxifolia*] already noticed from other sources [*R.A.M.*, xvii, pp. 494, 714].

Robertson (W. A.). **Report of the Director of Forest Products Research for the year 1937.**—*Rep. For. Prod. Res. Bd, Lond., 1937*, pp. 3–87, 9 pl., 2 figs., 6 graphs, 1938.

The following are among the items of interest occurring in this report [cf. *R.A.M.*, xvii, p. 362] apart from those already noticed from other sources. Extensive dry rot, usually due to *Coniophora cerebella* [*C. puteana*] and *Poria* spp., was found on a number of occasions in refrigerated ships [cf. ibid., xvii, p. 2], in which wooden linings are used and steel plates are fixed to wooden grounds, when the timber had become damp owing to condensation. In some new refrigerated vessels all the woodwork in the cold chambers is being treated under pressure with a water soluble preservative, as the ship is built.

Red stain (*Stereum sanguinolentum*) [see above, p. 26] was noted in spruce poles removed in thinnings from several plantations. *Fomes*

pinicola [see above, p. 2], comparatively rare in Great Britain, was twice isolated from trees affected with butt rot in Scotland.

In physiological studies it was found that cultures of Basidiomycetes occasionally ceased normal development, and presented a flat, sodden appearance suggestive of bacterial contamination, though no bacteria could be detected. These cultures seldom recovered, but their vigour was partly restored by frequent subculturing.

Laboratory tests showed that *Eucalyptus microcorys*, *Cedrus deodara*, and *Juniperus recurva* are very resistant to fungal decay, and that *Olea hochstetteri* is highly resistant to dry rot organisms. Resistance to fungal attack was much lower in *Quercus cerris* than in *Q. robur*.

CARTWRIGHT (K. ST. G.) & FINDLAY (W. P. K.). **Dry rot in wood.**—*Bull. For. Prod. Res., Lond.*, 1 (3rd Edition), 39 pp., 9 pl., 4 figs., 1938. 1*s.* 0*d.*

In the present and third edition of this bulletin [*R.A.M.*, xii, p. 669], the text has been thoroughly revised and the results of recent research work incorporated. The name *Poria vaillantii* is adopted in place of *P. vaporaria*. *P. xantha* [ibid., xvi, p. 6] is stated frequently to occur in greenhouse woodwork. *Trametes serialis* [ibid., xvii, p. 786; and above, p. 4] forms brown pockets of decay in timber of newly erected buildings, especially affecting Douglas fir [*Pseudotsuga taxifolia*] and other timbers imported from Canada and the United States in an unseasoned condition. The fungus ceases activity as soon as the wood is dried out.

PESCHEK (K.). **Holzschutz.** [Wood protection.]—*Öst. ChemZtg.*, xli, 16, pp. 299–305, 3 figs., 3 diags., 1938.

This is a comprehensive survey of the technique and practical application of some methods of timber preservation, embodying useful information on the fungi concerned in the destruction of wood, the estimated duration of life of poles and sleepers treated in various ways, and numerous other points of interest.

MAXSON (A. C.). **Root-rots of the Sugar Beet.**—*Proc. Amer. Soc. Sugar Beet Technol., 1938*, pp. 60–66, 1938. [Abs. in *Facts ab. Sug.*, xxxiii, 8, p. 36, 1938.]

At least eight major forms of root rot of sugar beets, exclusive of those affecting seedlings, may be distinguished [in the United States], namely, brown rot (*Rhizoctonia* [*Corticium*] *solani*) [see above, p. 5], dry rot (*R.* sp., possibly a strain of *C. solani*), red rot or root-killer (*R. crocorum*) [*Helicobasideum purpureum*: ibid., xvii, p. 368], *Fusarium* rot, brown rot, generally occurring in storage (*Phoma betae*) [ibid., xvii, p. 496], *Pythium* rot, sclerotial rot (*Sclerotium rolfsii*) [ibid., xvii, p. 643], and decay due to *Phytophthora drechsleri* [ibid., xv, p. 550]. To this list may be added a disease occurring in Texas and adjacent southern States, caused by the cotton root rot fungus, *Phymatotrichum omnivorum* [ibid., xvii, p. 674].

Pending the development of disease-resistant varieties the writer recommends seed disinfection for seed-borne disorders, applications of phosphate and boron, respectively, for black heart and heart and dry rot [ibid., xvii, p. 574], and rotation with small grains or maize

against the dry rot *Rhizoctonia*, for which potatoes, lucerne, sweet clover [*Melilotus alba*], beans [*Phaseolus vulgaris*], and garden truck may serve as hosts.

Cook (R. L.). **Boron deficiency in Michigan soils.**—*Proc. Soil Sci. Soc. Amer.*, ii, pp. 375–382, 1937. [Abs. in *Chem. Abstr.*, xxxii, 18, p. 7181, 1938.]

Boron deficiency in Michigan soils was associated either with heart rot or leaf injury of sugar beets. Lack of the trace element in lucerne [*R.A.M.*, xvi, p. 680; xvii, p. 344], red and alsike clovers [*Trifolium pratense* and *T. hybridum*], and sweet clover [*Melilotus alba*] is characterized chiefly by foliar reddening or yellowing. No damage to the crops resulted from applications of borax up to 80 lb. per acre.

Fourmont (R.). **Étude sur la désinfection des semences de Betteraves par le formol.** [Studies on the disinfection of Beet seeds with formalin.] —*Ann. Épiphyt.*, N.S., iv, 1, pp. 1–19, 7 figs., 2 graphs, 1938.

This is an expanded account of experiments on the control of *Phoma betae* already noticed from another source [*R.A.M.*, xvii, p. 285]. In inoculation experiments with *P. betae* infection of the seed-clusters did not succeed when they were steeped in, or sprayed with, suspensions of the fungus in sterilized water, but it was obtained by leaving the clusters in direct contact with young, vigorous cultures in Petri dishes for three days, and was most abundant when the seed-clusters were air-dry. A temperature of 10° to 12° was preferable to one of 20° to 25° [C.], and seedlings 3, 4, or 5 days old were the most readily infected. It is pointed out that the mycelium of the fungus, when established in the seed-clusters, permeates all the tissues, except three or four layers of sclerenchyma in the immediate vicinity of the seed, and is therefore difficult to kill by disinfectants. The disinfection of beet seeds is further complicated by the fact that germination may be adversely affected by strong antiseptics, such as sulphuric acid, even within a short time of action, owing to the permeability of the suture of the operculum covering the embryo.

Fife (J. M.). **Effect of sodium citrate on release of curly-top virus from aerobic precipitate of plant juice.**—*Phytopathology*, xxviii, 8, pp. 561–574, 6 graphs, 1938.

Sodium citrate was found to be very effective in releasing the sugar beet curly top virus [*R.A.M.*, xvii, p. 786] from alcoholic precipitates prepared from the juice of diseased sugar beets. The liquid was fed to non-viruliferous leafhoppers [*Eutettix tenellus*], and the usual procedure for inoculation followed, maximum infection (62 per cent. increase on the controls) resulting when the alcoholic precipitate was extracted with 6·8 mM. sodium citrate.

When the hydrogen-ion concentration of the extracted beet leaf juice containing the virus was increased below P_H 4·1 before precipitation with alcohol, a reduction in the amount of virus extracted by water was evident from the limited infection obtained. The virus was not, however, irreversibly inactivated at this hydrogen-ion concentration, or even at P_H 2·2, as extracts of the alcoholic precipitates with sodium

citrate caused infection comparable with that of former experiments. In another test the virus appeared to withstand brief exposures to a hydrogen-ion concentration approximate to P_H 1. The evidence suggests that the virus is fixed to other substances in such a manner that water is unable to release it from the precipitate.

Apparently, the same factors that fix or adsorb the virus in the juice from diseased beet leaves may also operate on the virus in juice from the tomato plant, the maximum percentage of infection with both plant juices being obtained after extraction of the precipitates with 6·8 mM. sodium citrate. Exposing the virus in the tomato plant juice to a hydrogen-ion concentration of P_H 4·1, however, had no effect on the amount subsequently released by water or sodium citrate.

It is suggested that these results may be explained on a basis of electrokinetic effects produced by the sodium citrate.

SEVERIN (H. H. P.). **Control of plant virus diseases in California.**—Abs. in *J. Bact.*, xxxvi, 3, pp. 289–290, 1938.

Curly top of sugar beets in California [see preceding abstract] may be combated by various methods, including adherence to a definite planting schedule to avoid coincidence between the development of the crop and the spring and autumn dispersal phases of the insect vector, *Eutettix tenellus*, and the cultivation of a resistant variety produced by the United States Department of Agriculture. Other lines of attack on the leafhopper are spraying and the destruction by summer hoeing, dragging, or disking of the alternate host (*Salsola kali-tenuifolia*), the ultimate elimination of which is envisaged by late autumn burning of the mature stands before the plants are torn loose and start rolling. Reference is also made to the control of western celery mosaic [ibid., xvi, p. 615; xvii, p. 798 and below p. 83] and peach mosaic [ibid., xvii, p. 798].

DECOUX (L.) & SIMON (M.). **L'influence de la jaunisse et de la pourriture du cœur sur la composition de la Betterave sucrière.** [The influence of yellows and heart rot on the composition of the Sugar-Beet.]—*Publ. Inst. belge Amélior. Better.*, vi, 4, pp. 265–270, 1938. [Flemish, German, and English summaries.]

The leaves of apparently healthy beets and beets affected with virus yellows [*R.A.M.*, xvii, p. 428] dug from the same field in Belgium on 7th September, 1937, contained, respectively, 0·61 and 0·54 per cent. total nitrogen (fresh material), the corresponding figures for the green (healthy) and yellow (diseased) areas of the leaves of individual plants dug a fortnight later being 0·64 and 0·38 per cent. The roots of the affected plants averaged about 40 per cent. more nitrogenous materials than those of the healthy beets.

The roots of beets affected with heart rot [ibid., xvi, p. 789; xvii, p. 643] showed 49·6 per cent. more nitrogen than those of healthy beets.

DECOUX (L.), VANDERWAEREN (J.), & ROLAND (G.). **La végétation de la Betterave en Belgique au cours de l'année 1937.** [The growth of the Beetroot in Belgium during the year 1937.]—*Publ. Inst. belge Amélior. Better.*, vi, 4, pp. 271–290, 1 graph, 1938. [Flemish, German, and English summaries.]

The following beet diseases were recorded in Belgium in 1937. Blackleg [associated with *Pythium de Baryanum*, *Corticium solani*, and *Phoma betae*: *R.A.M.*, xv, p. 764] was prevalent in Brabant and Flanders. Seed disinfection is not resorted to frequently enough by the local growers. *Cercospora* [*beticola*] and rust [*Uromyces betae*] caused little damage. Virus yellows [see preceding abstract] was general throughout the entire beet-growing area, especially in Flanders and Hainaut, where forage beets are widely grown for seed purposes and act as sources of infection for the vectors. Control [ibid., xv, p. 549] consists in the selection of healthy transplants, late sowing of transplants, the maintenance of a wide distance between the fields of transplants and other beet fields, the suppression of the vectors on the transplants and seed-bearers, early sowing of the beet fields, and the ploughing in of winter spinach before 1st April. A few cases of heart rot due to boron deficiency [see preceding abstract] and of symptoms resembling magnesium deficiency [ibid., xvi, p. 649] were also noted.

Singalovsky (Z.). **Étude morphologique, cytologique et biologique du mildiou de la Betterave (Peronospora schachtii Fuckel).** [A morphological, cytological, and biological study of Beetroot mildew (*Peronospora schachtii* Fuckel).]—*Ann. Épiphyt.*, N.S., iii, 4, pp. 552–618, 40 figs., 7 graphs, 1937. [Received October, 1938.]

This detailed study of beet downy mildew (*Peronospora schachtii*) has already been noticed from another source [*R.A.M.*, xvii, p. 365].

Ovinge (A.). **Kwade harten-proeven in Zeeland in 1937.** [Marsh spot experiments in Zealand in 1937.]—*Tijdschr. PlZiekt.*, xliv, 4, pp. 208–213, 1938.

Further tests in Zealand, Holland, in 1937 demonstrated that for practical purposes marsh spot of Schokker peas [*R.A.M.*, xvi, p. 582] may be effectively combated by the application to the soil, just as the plants are about to flower, of 75 to 100 kg. per hect. manganese sulphate. Applications of 100 kg. slightly increased the yield in two plots (from 31 and 27 kg. per are to 32 and 28·5 kg., respectively) [as corrected by the author in *Tijdschr. PlZiekt.*, xliv, 5, p. 256, 1938]. Spraying with a solution of the compound (1 per mille) before flowering reduced the incidence of the disease by about half; no appreciable improvement was obtained by raising the strength up to 1 per cent., but excellent results were secured in tests involving three treatments (two before flowering and one after) with manganese sulphate at the strength of 1 per mille.

Cooley (J. S.). **Susceptibility of crop plants and weeds to Sclerotium rolfsii.**—*Phytopathology*, xxviii, 8, pp. 594–595, 1938.

In the spring of 1937 pepper [*Capsicum annuum*], tomato, eggplant, cowpeas, Wilson soy-beans, navy beans [*Phaseolus vulgaris*], kidney beans [*P. vulgaris*], red clover [*Trifolium pratense*], mammoth clover [*T. medium*], alsike clover [*T. hybridum*], spring oats, and Korean lespedeza (*Lespedeza stipulacea*) were grown in a plot at the Horticultural Field Station, Beltsville, Maryland, in which, in 1935 and 1936, 20 per

cent. of the apple trees then growing there (subsequently removed) had been killed off by *Sclerotium rolfsii* [*R.A.M.*, xvi, p. 757]. The seed was planted or the plants set on 18th May. After about three weeks 1 out of 30 pepper plants, 1 kidney bean, and 2 cowpea plants out of several hundred were dead from the disease. After four weeks, 2 navy bean and 2 more cowpea plants were dead. On 29th July the disease showed no further advance on the beans or peppers, but the lespedeza showed about 20 per cent. infection. On 29th August more lespedeza plants had succumbed, but no further advance had occurred on the other plants. By the end of the season all the lespedeza plants were dead, except those in one 6-ft. section of a row. Neither the clover varieties nor the soy-beans became affected. Weeds showing infection were *Euphorbia preslii* and *Portulaca oleracea*, but even these were only slightly affected.

It would appear that climatic conditions in Maryland do not generally favour the disease, relatively few sclerotia surviving the winter. *L. stipulacea* may prove to be of use as an indicator crop, but should not be employed as a cover crop before planting susceptible plants.

British Honduras. Statutory Rules and Orders, Proclamation No. 10, 1938.—3 pp., 1938.

By this Proclamation, dated February 12th, 1938 [cf. *R.A.M.*, xi, p. 352], the importation of citrus species and coco-nuts and all parts of these plants is prohibited from all countries except in the case of importations made by the Department of Agriculture for scientific purposes. All fruits except green bananas, nuts, and processed fruits, and all vegetables except potatoes, onions, dried beans, peas, and grains, processed vegetables, and seeds are prohibited from importation from all countries except the United States, United Kingdom and Eire, and Canada, a certificate of introduction granted by the Agricultural Officer after inspection being required in the case of Jamaica. Tobacco seeds, cotton seeds and plants, and sugar-cane plants may be imported only under licence. Plants of banana and any other species of *Musa* from the West Indian Islands, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, South America, Canary Islands, and West Africa may be imported under licence. For the importation of earth or soil and any living plants not specified above a certificate of introduction must be granted by the Agricultural Officer after inspection.

Service and regulatory announcements. April–June, 1938.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 135, pp. 54–55, 1938.

The white pine blister rust (*Cronartium ribicola*) quarantine regulations restricting the inter-State movement of five-leaved pines in the United States [*R.A.M.*, xvi, p. 143] are withdrawn as from 1st July, 1938, except for 10 northern counties of California, 6 States in the west, and five States in the south-east, where the blister rust has not yet been found, since the rust has now become established in most of the commercially valuable pine-producing areas, and can, furthermore, spread naturally from pines to *Ribes* for a distance of over 150 miles.